Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team should include representatives from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014).

Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that despite increases in knowledge across a range of domains and progress implementing many of the actions, the Plan's overall objective has not been achieved and "*that there were ongoing declines in the number of mature individuals, and in the area and quality of habitat available for the species, including clearing of breeding habitat*". Of 28 specific actions in the plan, at the time of the review: seven were considered not to have commenced or had otherwise made only minimal progress; some progress had been made for 14 actions; and seven were identified as completed and/or ongoing.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in

knowledge and scientific evidence (Webb et al. 2019). While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, such as the Public Authority Management Agreement covering the Southern Forests in Tasmania, there remain many unresolved challenges for habitat protection. Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of forestry operations (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of *pip-pip-pip* (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east regions of Tasmania (Figure 2), with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low,

probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, the Action Plan for Australian Birds suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011), but has declined since and was estimated to be 750 (range 300-1,000) mature individuals in 2020 (Webb et al. 2021). A preliminary study using genetic data has estimated the effective population size (N_e) of the Swift Parrot to be between 60–338 individuals (Olah et al. 2020) noting that N_e is a parameter commonly used in population genetics to quantify loss of genetic variation in populations and it is often smaller than the census population size (N_c) (e.g. Wang et al. 2016).

While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an

extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011).

While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

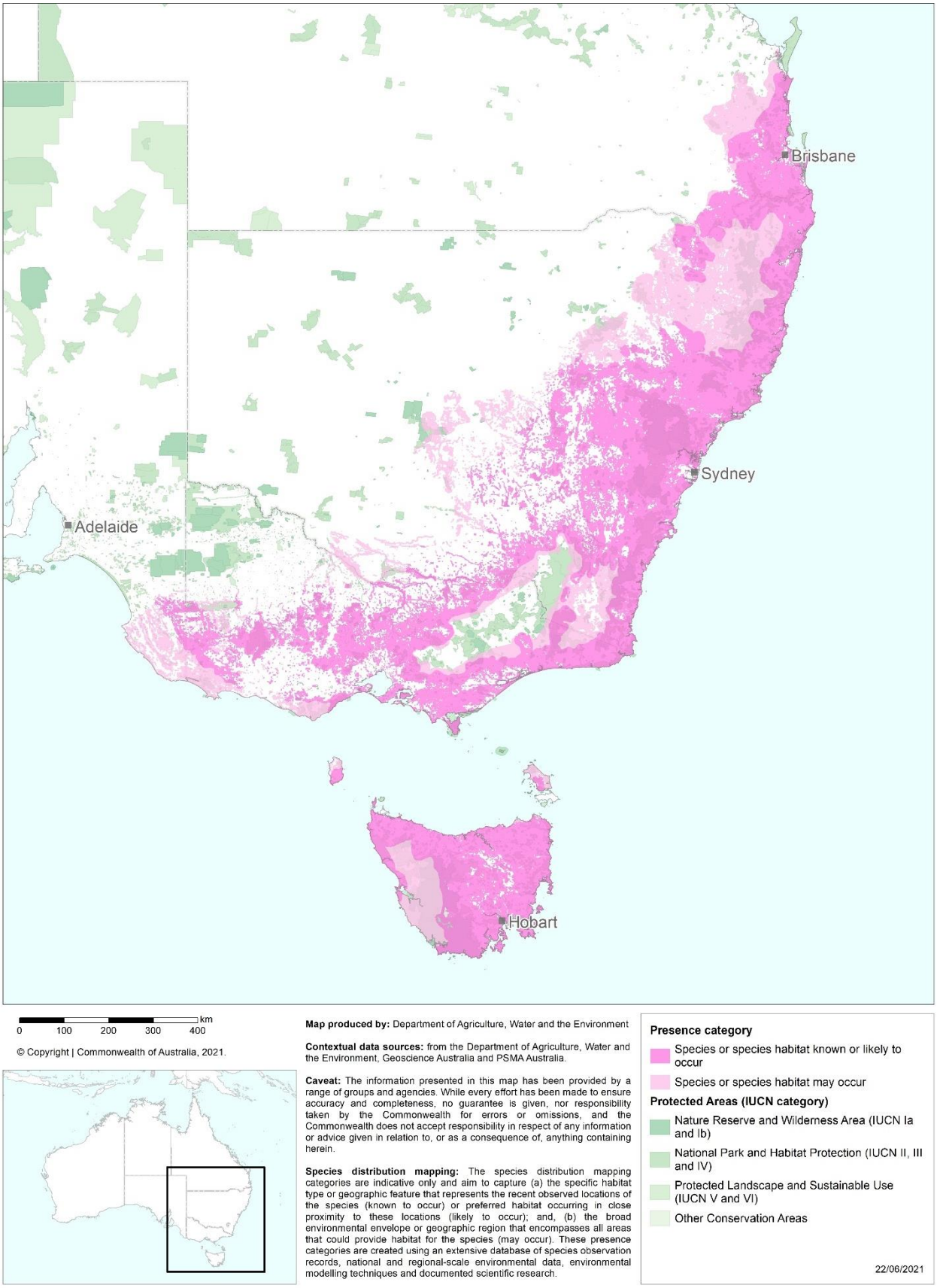

Figure 1 – Indicative distribution of the Swift Parrot in Australia

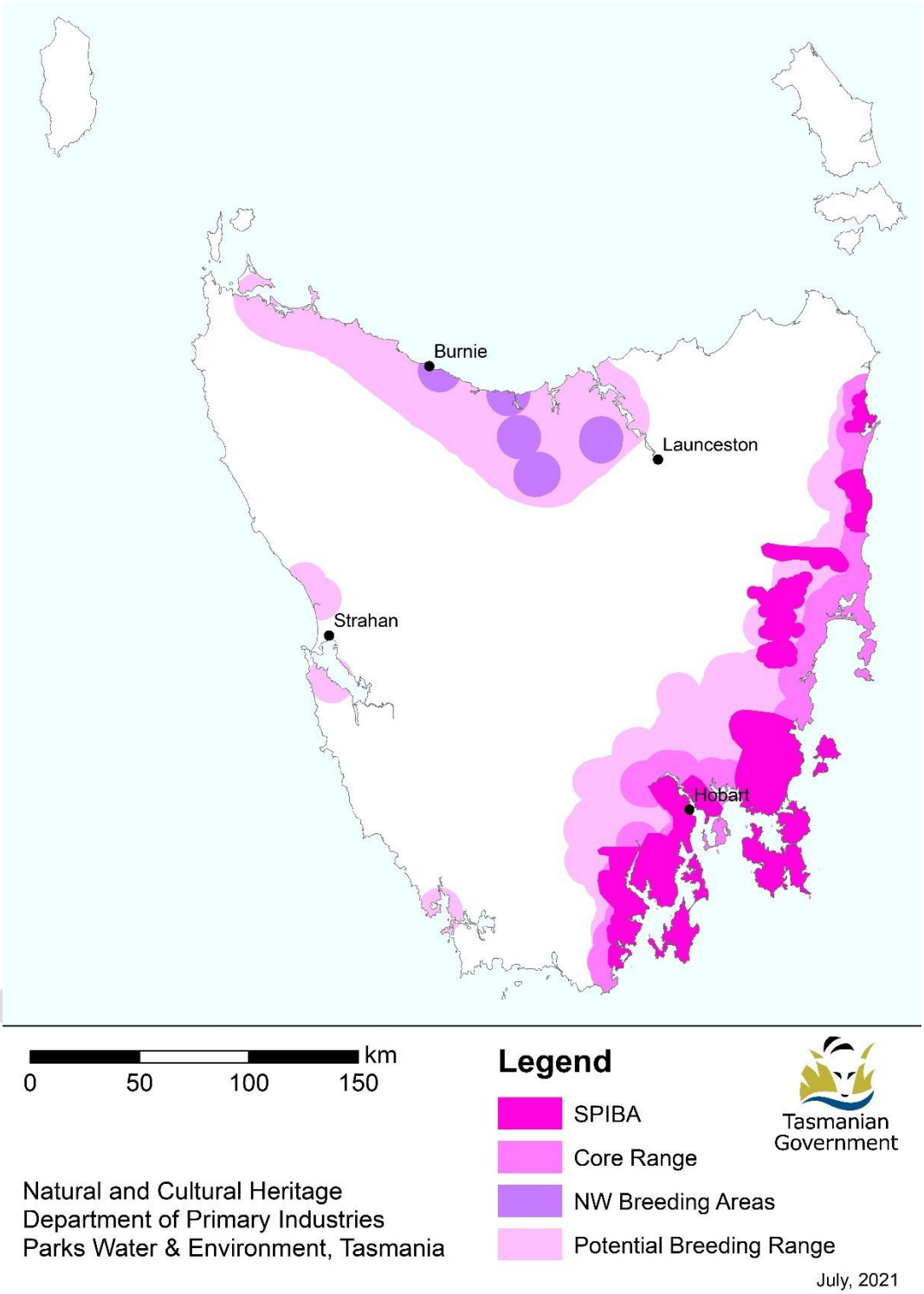

Figure 2 – Potential breeding range of Swift Parrot in Tasmania*

*Swift Parrot Important Breeding Area (SPIBA) are known or suspected to have supported a large portion of the Swift Parrot breeding population in any given year[1]

The core range of the Swift Parrot is the area within the SE potential breeding range that is within 10km of the coast or is designated as a SPIBA (as defined in FPA 2010)[2]

The potential breeding range of the Swift Parrot comprises the NW potential breeding range and the SE potential breeding range. The NW potential breeding range includes the NW breeding areas (known nesting locations e.g. Gog Range, Badger Range, Kelcey Tier)[2]

References:
[1]Forest Practices Authority (FPA) (2010). Interim Species Habitat Planning Guideline for the Conservation Management of *Lathamus discolor* (Swift Parrot) in Areas Regulated under the Tasmanian Forest Practices System. Internal report to the Forest Practices Authority, Hobart, Tasmania.

[2]'Threatened fauna species range boundaries and habitat descriptions' V1.12 May 2021 at https://www.fpa.tas.gov.au/__data/assets/pdf_file/0011/111404/Threatened_fauna_range_and_habitat_descriptions_Table_Nov_19.pdf.

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Other foraging species may be important at certain times of the year. Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (S. Vine BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005).

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 2). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). The flowering patterns of other potential forage eucalypt species, including Brooker's Gum (*E. brookeriana*), may also be important determinants of Swift Parrot breeding distribution.

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used

as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). From one season to the next, Blue Gum or Black Gum may comprise the primary foraging resource. Planted Blue Gums (e.g. street and plantation trees) may provide a temporary local food resource in some years, noting that plantation Blue Gum are unlikely to provide substantial forage resources due to age, tree density and genetic strain (FPA 2014).

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature,

pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8 eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This is a non-statutory process guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However, existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.

- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.

- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.

- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods

which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of

woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot in a given year, subject to seasonal flowering conditions.

- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Endangered Forty-spotted Pardalotes, and, subject to seasonal flowering conditions, a significant number of Swift Parrots.

- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;

- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The migratory nature of the species means that they require a large network of resources both during and between annual cycles. Actions that directly and/or indirectly affect the species or their habitats could compromise recovery.

Noting the requirements of the species, habitat critical to the survival for the Swift Parrot includes:

Breeding and foraging habitat in Tasmania

- In different years the majority of the breeding population may be concentrated within a subset of the potential breeding range, according to spatially and temporally variable flowering patterns of preferred foraging species.
- Therefore, within areas where breeding is most likely to occur based on known breeding records, scientific literature and expert opinion, habitat critical to survival of Swift Parrots comprises both *potential foraging habitat* – which is native forest and woodland containing either Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species, and *potential nesting habitat* – which is forests or woodlands containing hollow-bearing eucalypt trees within foraging range (~10km) of potential foraging habitat that is old enough to flower.

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*).

Key considerations in assessing environmental impacts

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. It is essential that protection is provided to these areas and that enhancement and restoration measures target these productive sites.

Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed. Actions that have indirect impacts on habitat critical to the survival should be minimised (i.e. noise and light pollution). Actions that compromise adult and juvenile survival should also be avoided, such as the introduction of new diseases or predators.

Actions that remove habitat critical to the survival would interfere with the recovery of Swift Parrots and reduce the area of occupancy of the species. In Tasmania, it is important to retain a mosaic of breeding habitat (i.e. nesting and foraging areas), particularly on Bruny and Maria Islands where Sugar Gliders are not present. Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time. If removal of habitat critical to the survival cannot be avoided or mitigated then an offset should be provided.

Surveys

When considering habitat loss, alteration or degradation to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots.

In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a given location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

THREATS

3.1 Historical causes of decline

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003). In Tasmania there has also been significant historical loss and alteration of habitat within the primary breeding and foraging range, along the south-east coast. This has included the loss of approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011) and over 90 percent of Black Gum – Brookers Gum forest (Department of Environment and Energy 2018).

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the predation of nestlings and incubating females by the introduced Sugar Glider, ongoing loss or degradation of breeding and foraging habitat through a range of processes including, forestry operations, land clearing and wildfire. The main threats on the Australian mainland include habitat loss from land clearing for agriculture and urban development, and to a lesser extent forest harvesting. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change.

3.2.1 Habitat loss and alteration

Forestry and land clearing

Loss of potential breeding habitat in Tasmania via clearance for conversion to agriculture, native forest logging and intensive native forest silviculture practices continues to reduce the amount of available Swift Parrot nesting and foraging habitat and it therefore remains a significant threat to the continued persistence of the species (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017, Webb et al. 2019).

There are no comprehensive estimates assessing loss of potential breeding habitat through forest harvesting or land clearing in recent years across the species breeding range. However one case study using the Southern Forests Swift Parrot Important Breeding Area (SPIBA) (one of 12 key breeding regions delineated for management purposes, Forest Practices Authority, 2010) estimated that forest harvesting between 1997 and 2016 had resulted in as much as 23 percent of identified potential nesting habitat being lost in this time, noting that prior to 2007, this region was not recognised as supporting Swift Parrot breeding (Webb et al. 2019).

Much of the Swift Parrot potential breeding habitat in Tasmania is on private and public land that is subject to management arrangements under the Tasmanian Forest Management System.

The process of adaptive management and continuous improvement is built into the Tasmanian Forest Management System, and specific management arrangements for Swift Parrots have continued to evolve since 1996 to account for new knowledge (e.g. Forest Practices Authority 2010; Munks et al. 2004). However there remains an ongoing need for continual monitoring, evaluation and adaptive improvement in management approaches, particularly with regards to measures addressing habitat recruitment, the refinement of knowledge including in regards to nesting and foraging habitat requirements and their spatial and temporal availability.

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The loss of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest

loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban and agricultural land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

In 2013 and 2019, fires in Tasmania impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas

burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and the likelihood of Sugar Glider predation decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). The Tasmanian Government subsequently amended Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 to remove Sugar Gliders in 2018. Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows.

An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from a range of native and non-native species, including the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data).

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single threat increases the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change

impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Identify breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
1.2	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business

1.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan	**Australian Government** **State governments** **Local government**	Core government business
1.4	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

1.5	Reduce firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat • Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** **Private landholders**	$75,000 pa
1.6	Develop agreements between local government and government agencies that aim to maintain and enhance Swift Parrot habitat	2	• Management agreements have been developed between local government and state government agencies which maintain and enhance Swift Parrot habitat • Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** Private landholders	$150,000 pa
1.7	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
1.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified	**Australian Government** **State governments** **Local government**	$150,000 pa

			• Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	**NRM regional bodies** Private landholders BirdLife Australia NGOs	
1.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 2**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
2.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped	**Tasmanian Government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	NGOs Academic institutions	
2.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
2.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000 pa
2.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions	**Tasmanian Government** **NRM regional bodies**	$50,000

			• An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Research agencies** NGOs Academic institutions	
2.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
2.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
2.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to Maria and Bruny Islands	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2023 • The management plan has included rapid response	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$75,000 pa

			protocols to eliminate Sugar Gliders on Maria and Bruny Islands		
2.8	Continue regulatory reform of Sugar Glider protected wildlife status	1	• The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core government business

***Strategy 3**: Monitor and manage other sources of mortality*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
3.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000

3.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
3.5	Investigate the potential impacts of bees, starling and Rainbow Lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

Strategy 4*: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action	**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**

4.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa
4.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
4.4	Maintain a free and openly available database for population, habitat and distributional data	2	• A free and openly available central repository for reporting monitoring observations has been identified • Relevant government databases have been maintained and updated on a regular basis	**Recovery Team** **State governments** **Research agencies** NGOs	$50,000 pa

			• Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	Academic institutions BirdLife Australia	
4.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to inform management actions and priorities	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

***Strategy 5**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management • Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
5.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns,	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa

			patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions		
5.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$140,000 pa
5.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

***Strategy 7**: Coordinate, review and report on recovery progress*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2021)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 2	$555,000	$475,000	$475,000	$475,000	$475,000	$2,455,000
Strategy 3	$125,000	$50,000	$50,000	$50,000	$50,000	$325,000
Strategy 4	$340,000	$275,000	$275,000	$200,000	$275,000	$1,365,000
Strategy 5	$415,000	$415,000	$665,000	$415,000	$415,000	$2,325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$30,000	$60,000	$30,000	$40,000	$190,000
TOTAL	$2,935,000	$2,715,000	$2,995,000	$2,640,000	$2,725,000	$14,010,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Department of Planning, Industry and Environment; Forestry Corporation of NSW
Queensland – Department of Environment and Science
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – Environment, Planning and Sustainable Development Directorate
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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SWIFT PARROT RECOVERY PLAN

Vision, Objectives, Strategies and Recovery Actions

Vision

- To implement management measures to ensure the wild population of swift parrots increases over time, ~~and stabilises at~~to a point where it is no longer considered critically endangered

Recovery plan objectives:

- The size of the swift parrot population has grown
- A demonstrable improvement in the quality and quantity of swift parrot breeding and foraging habitat has occurred

Recovery Plan strategies:

1. Improve understanding of habitat use and population trajectory
2. Manage and protect swift parrot habitat
3. Reduce impacts from sugar gliders at breeding sites
4. Monitor and manage other sources of mortality
5. Engage community and stakeholders in swift parrot conservation
6. Coordinate, review and report on recovery process

Actions to achieve specific objectives

Actions identified for the recovery of the swift parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the swift parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the swift parrot.

Priority 3: Action is desirable, but not critical to the recovery of the swift parrot or assessment of trends in that recovery.

Commented [CA1]: Hopefully we have continuing improvement

Commented [CA2]: "wild" population?

Commented [CA3]: This might be very hard to achieve and/or measure in the timeframe of the Plan (acknowledging the caveat regarding timeframes that is in this draft). An improvement in the protection of SP habitat may be a more measurable outcome?

Strategy 1 – Improve understanding of habitat use and population trajectory

ACTION		Priority	Performance Criteria	Partners
1.1	Continue to undertake fine scale mapping of breeding habitat to inform management	1	• Monitoring program continued throughout the life of this plan • Nesting sites identified and mapped each breeding season • Nest trees identified and entered into database	Research Land managers
1.2	Continue research on breeding success, survival and mortality	2	• Existing knowledge of breeding success, survival and mortality expanded	Research
1.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH
1.4	Better understand site use, landscape use and habitat bottlenecks.	2	• Key winter foraging sites identified and documented. This includes sites identified in Section XX (of the RP) and any new sites identified through Action 1.3. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as phenology and climate.	Research Birdlife OEH DELWP
1.5	Develop and apply techniques to estimate changes in population trajectory	1	• Changes in abundance of swift parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research Birdlife
1.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the swift parrot over the next 100 years.	2	• Modelling undertaken identifying key areas of habitat that will become refuge for the swift parrot over the next 100 years • Consideration taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.).	Research Birdlife

Commented [CA4]: Is this referring to the mapping of individual nest sites or the identification of key areas by season? These are different actions with different resource requirements.

Commented [CA5]: Used vs potential nest trees?

Strategy 2 – *Manage and protect swift parrot habitat at the landscape scale*

ACTION		Priority	Performance Criteria	Partners
2.1	Ongoing state and Commonwealth commitment to support strategic planning for swift parrot breeding habitat in areas subject to forest practices	1	• Ongoing monitoring of the effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System • Completion of the strategic planning process in the southern forests by Sustainable Timber Tasmania and DPIPWE • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the core SE breeding range of this species.	DoEE DPIPWE STT FPA
2.2	Implement in full the Forest Practices Authority management prescriptions to maintain and enhance swift parrot breeding habitat.	1	• Forest Practices Authority 'Threatened Fauna Adviser' recommended actions implemented in full for all harvesting operations. • Application of the Duty of Care provision consistently applied at a larger forest management unit scale (e.g., forest block) on Permanent Timber Production Zone Land. • Any logging actions undertaken which are not consistent with the Threatened Fauna Adviser recommendations are investigated and compliance action taken.	DPIPWE STT FPA
2.3	Review and revise swift parrot management prescriptions and approaches as new information becomes available.	1	• New information on breeding and foraging locations ~~are~~ is incorporated into the existing regulations, codes of practice and management plans to better manage the swift parrot population across its range.	DPIPWE STT FPA ANU
2.4	Protect high quality areas of swift parrot breeding and foraging habitat (as described in the Habitat critical section) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Developments avoided on any known swift parrot breeding areas (breeding areas shown in Figure ?). • Clearing of mature foraging and nesting trees in areas of habitat critical to the survival of the species (as described in ??) has been limited. • Any developments in areas of mapped breeding habitat (figure 1), or areas critical to survival (section ??) have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that	DoEE DPIPWE OEH DEHP DELWP

Commented [CA6]: This is unlikely to be a meaningful performance criteria

Commented [CA7]: This goes well beyond scope as well

Commented [CA8]: That would not be a performance criteria as the DoC would potentially allow for habitat loss

Commented [CA9]: This doesn't accurately represent how the system actually works – the TFA provides a range of approaches that can be applied – it's adherence to the Forest Practices Plan (FPP) that can trigger compliance/enforcement action. Therefore it's perhaps clearer to say "actions not consistent with the TFA recs as contained in the Forest Practices Plan".

			proceeded provided offsets that protected and/or rehabilitated habitat of equivalent or better quality.	
2.5	Where useful, develop management agreements with local councils and government agencies that aim to maintain and enhance swift parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance swift parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving swift parrot breeding habitat.	DoEE DPIPWE OEH DEHP DELWP
2.6	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 1.4) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
2.7	Identify existing remnants close to priority sites for protection (across tenures)	3	• Remnants close to key winter foraging sites identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
2.8	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs to maximise the benefits of covenants aiming to protect swift parrot breeding habitat.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs. • The extent of quality habitat protected through covenanting and other private land conservation programs is increased (e.g., through land covenants).	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
2.9	Enhance existing breeding habitat	1	• Identify and prioritise areas for management of regenerating and regrowth blue gum or black gum forest and large-scale plantings of blue gum and black gum. • Manage regenerating and regrowth blue gum or black gum forest to provide breeding habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE Research Birdlife NGOs

Commented [CA10]: "management agreements" may have a specific (and restrictive) meaning in this context, so perhaps remove "management"

Commented [CA11]: Defn?

Strategy 3 – Reduce impacts from sugar gliders at breeding sites

ACTION		Priority	Performance Criteria	Partners
3.1	Determine sugar glider density across key swift parrot breeding areas	1	• Sugar glider density across key swift parrot breeding areas known and mapped.	Research
	Identify island and remote areas of significance to SP that are free of sugar gliders		• Sugar glider presence/absence mapped	Research DPIPWE
	Undertake control actions in locations of significance to SP where eradication or containment is feasible (ie islands and isolated populations)		• Areas significant to SP are glider free	DPIPWE research
3.2	Test mechanisms to restrict sugar gliders from swifwillt parrot nest hollows	1	• Sugar glider exclusion trials undertaken in key swift parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
3.3	Trial methods to reduce sugar glider density from key breeding areas	1	• Trails undertaken testing the impacts of masked owl playbacks on sugar glider density and swift parrot mortality and success. • Trials undertaken testing the impacts of directly reducing sugar glider density (through trapping and euthanizing) on swift parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of sugar gliders	1	• Improved understanding of the re-colonisation dynamics of sugar gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of sugar gliders in south-east Tasmania	Research
3.5	Further investigate the link between forest condition and predation rates	1	• Improved understanding of the link between forest condition, sugar glider density and swift parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to sugar glider management	1	• Targeted communications strategy developed that communicates why sugar glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DIPWE Research Birdlife
3.7	Reduction of sugar glider predation rates on swift parrots over the breeding season.	1	• Outcomes of trials to reduce impacts on swift parrots from sugar gliders during breeding attempts	DIPWE Research

			operationalised. May include increased use of nest protection methods and/or programs to directly reduce sugar glider numbers, with a particular focus on reductions at key locations over the breeding season.	
3.8	Early detection, and control, of sugar glider introduction to islands	1	• Process developed and implemented to ensure early detection of sugar gliders on islands where swift parrots breed but which are currently sugar glider free. • Management plan to control sugar gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DIPWE Research Birdlife
3.9	Regulatory reform of sugar glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4 - Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Partners
4.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible via relevant web sites. • Collision mitigation strategy developed to help land managers determine appropriate mitigation measures for developments in areas where collisions are likely.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
4.2	Encourage appropriate plantings in urban areas to discourage foraging swift parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife
4.3	Strengthen penalties for 'taking' threatened species in Tasmania	2	• Current penalties for taking threatened species in Tasmania strengthened.	DPIPWE
4.4	Continue to monitor for incidence of Psittcine Beak and Feather Disease	2	• Incidence of PBFD recorded during handling and monitoring of swift parrots and baseline of disease established • Management strategy for PBFD developed if incidence of disease is noted to be increasing overtime.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research

Commented [CA12]: I've been thinking about this and I think that the RP at least acknowledges the potential benefit in researching possible solutions to PBFD (eg vaccine). If (heaven forbid) the SP numbers continue to decline then the importance of PBFD will increase (as it has for OBP).

Strategy 5 – Engage community and stakeholders in swift parrot conservation

ACTION		Priority	Performance Criteria	Partners
5.1	Undertake training and awareness programs on swift parrot threats and management for land managers, regulators, biological consultants and natural resource management practitioners.	1	• Training and awareness programs developed and/or updated • Training provided to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
5.2	Disseminate educational material on threats and management of swift parrot habitat	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
5.3	Engage indigenous landholders where appropriate to undertake Recovery Plan related activities.	1	• Indigenous landholders engaged and involved in swift parrot recovery plan activities.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research

Strategy 6 – Coordinate, review and report on recovery process

ACTION		Priority	Performance Criteria	Partners
6.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research

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Commented [MS1]: Not sure if this is actually achievable. Maybe 'a demonstrable improvement in the management of swift parrot breeding habitat (includes nesting and foraging).'

Recovery Plan strategies:

1. Improve understanding of habitat use and population trajectory
2. Manage and protect swift parrot habitat
3. Reduce impacts from sugar gliders at breeding sites
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Strategy 1 – Improve understanding of habitat use and population trajectory

ACTION		Priority	Performance Criteria	Partners
1.1	Continue to undertake fine scale mapping of breeding habitat to inform management	1	• Monitoring program continued throughout the life of this plan • Nesting sites identified and mapped each breeding season • Nesting ~~trees~~ sites identified and entered into database	Research
1.2	Continue research on breeding success, survival and mortality	2	• Existing knowledge of breeding success, survival and mortality expanded	Research
1.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH
1.4	Better understand site use, landscape use and habitat bottlenecks.	2	• Key winter foraging sites identified and documented. This includes sites identified in Section XX (of the RP) and any new sites identified through Action 1.3. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as phenology and climate.	Research Birdlife OEH DELWP
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1.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the swift parrot over the next 100 years.	2	• Modelling undertaken identifying key areas of habitat that will become refuge for the swift parrot over the next 100 years • Consideration taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.).	Research Birdlife

Commented [MS2]: Would be good if the Recovery Team could deiscuss the definition of this term 'nesting site'. It is currently interpreted as a single tree with a hollow that has been used for rearing young. Such 'sites are very difficult to locate.
Maybe a 'nesting location' would be more appropriate.

Commented [MS3]: See comment above

Commented [MS4]: What about work to predict flowering patterns?

Strategy 2 – *Manage and protect swift parrot habitat at the landscape scale*

ACTION		Priority	Performance Criteria	Partners
2.1	Ongoing state and Commonwealth commitment to support strategic planning for swift parrot breeding habitat in areas subject to forest practices	1	• Ongoing monitoring of the effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System • Completion of the strategic planning process in the southern forests by Sustainable Timber Tasmania and DPIPWE • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the core SE breeding range of this species.	DoEE DPIPWE STT FPA
2.2	Implement in full the DPIPWE/Forest Practices Authority management recommendations ~~prescriptions~~ to maintain and enhance swift parrot breeding habitat.	1	• Forest Practices Authority 'Threatened Fauna Adviser' recommended actions implemented in full for all harvesting operations. • Application of the Duty of Care provision consistently applied at a larger forest management unit scale (e.g., forest block) on Permanent Timber Production Zone Land. • Any logging actions undertaken which are not consistent with the Threatened Fauna Adviser recommendations are investigated and compliance action taken (if necessary).	DPIPWE STT FPA
2.3	Review and revise swift parrot management ~~prescriptions~~ recommendations, planning tools and ~~approaches~~ procedures as new information becomes available.	1	• New information on breeding and foraging locations are incorporated into the existing regulations, codes of practice, ~~and~~ management plans, management recommendations, planning tools and procedures to better manage the swift parrot population across its range.	DPIPWE STT FPA ANU
2.4	Protect ~~high quality~~ areas of 'high risk' swift parrot breeding ~~and foraging~~ habitat (as described in the Habitat critical section) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Developments avoided on any known swift parrot breeding areas (breeding areas shown in Figure ?). • Clearing of mature foraging and nesting trees in areas of habitat critical to the survival of the species (as described in ??) has been limited. • Any developments in areas of mapped breeding habitat (figure 1), or areas critical to survival (section ??)	DoEE DPIPWE OEH DEHP DELWP

Commented [MS6]: The Board recently agreed to this (I think)

Commented [MS5]: They aren't 'prescriptions' until they are incorporated into an FPP (Forest Practices Plan).

Commented [MS7]: In some cases they may not be exactly the same as the TFA recs because of new information/other factors determined during the planning process. Add 'if necessary' to allow for those situations where the 'risk assessment' process followed during planning shows that the actions should be different or may not be required at all.

Commented [MS8]: Areas important for protection should be identified through a risk assessment process using all available information on the part of the range the 'proposed activity' is in, whether or not breeding habitat is present, the presence of known nesting sites and the availability of habitat in the surrounding landscape.

Commented [MS9]: The term 'Breeding habitat' encompasses both foraging and nesting habitat in our policy and planning tools.

			have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded provided offsets that protected and/or rehabilitated habitat of equivalent or better quality.	
2.5	Where useful, develop management agreements with local councils and government agencies that aim to maintain and enhance swift parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance swift parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving swift parrot breeding habitat.	DoEE DPIPWE OEH DEHP DELWP
2.6	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 1.4) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
2.7	Identify existing remnants close to priority sites for protection (across tenures)	3	• Remnants close to key winter foraging sites identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
2.8	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs to maximise the benefits of covenants aiming to protect swift parrot breeding habitat.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs. • The extent of quality habitat protected through covenanting and other private land conservation programs is increased (e.g., through land covenants).	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research FPA
2.9	Enhance existing breeding habitat	1	• Identify and prioritise areas for management of regenerating and regrowth blue gum or black gum forest and large-scale plantings of blue gum and black gum. • Manage regenerating and regrowth blue gum or black gum forest to provide breeding habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land	DPIPWE Research Birdlife NGOs

Commented [MS10]: I think this needs more work otherwise it looks like a different approach taken for other industries?

Commented [MS11]: Not sure offsets would work for breeding habitat?

Commented [MS12]: WE are also involved in this process

Commented [MS13]: The forest industry would also be interested in doing this.

			holders and land managers in priority areas through a strategic landscape approach.	

Strategy 3 – Reduce impacts from sugar gliders at breeding sites

ACTION		Priority	Performance Criteria	Partners
3.1	Determine sugar glider density across key swift parrot breeding areas	1	• Sugar glider density across key swift parrot breeding areas known and mapped.	Research
3.2	Test mechanisms to restrict sugar gliders from swift parrot nest hollows	1	• Sugar glider exclusion trials undertaken in key swift parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
3.3	Trial methods to reduce sugar glider density from key breeding areas	1	• Trialsails undertaken testing the impacts of masked owl playbacks on sugar glider density and swift parrot mortality and success. • Trials undertaken testing the impacts of directly reducing sugar glider density (through trapping and euthanizing) on swift parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of sugar gliders	1	• Improved understanding of the re-colonisation dynamics of sugar gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of sugar gliders in south-east Tasmania	Research
3.5	Further investigate the link between forest condition and predation rates	1	• Improved understanding of the link between forest condition, sugar glider density and swift parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to sugar glider management	1	• Targeted communications strategy developed that communicates why sugar glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DIPWE Research Birdlife
3.7	Reduction of sugar glider predation rates on swift parrots over the breeding season.	1	• Outcomes of trials to reduce impacts on swift parrots from sugar gliders during breeding attempts operationalised. May include increased use of nest protection methods and/or programs to directly reduce sugar glider numbers, with a particular focus on reductions at key locations over the breeding season.	DIPWE Research

Commented [MS14]: What is meant by 'forest condition' here? I'd make this clearer

3.8	Early detection, and control, of sugar glider introduction to islands	1	• Process developed and implemented to ensure early detection of sugar gliders on islands where swift parrots breed but which are currently sugar glider free. • Management plan to control sugar gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DIPWE Research Birdlife
3.9	Regulatory reform of sugar glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4 - Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Partners
4.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible via relevant web sites. • Collision mitigation strategy developed to help land managers determine appropriate mitigation measures for developments in areas where collisions are likely.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
4.2	Encourage appropriate plantings in urban areas to discourage foraging swift parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife
4.3	Strengthen penalties for ‘taking’ threatened species in Tasmania	2	• Current penalties for taking threatened species in Tasmania strengthened.	DPIPWE
4.4	Continue to monitor for incidence of Psittcine Beak and Feather Disease	2	• Incidence of PBFD recorded during handling and monitoring of swift parrots and baseline of disease established • Management strategy for PBFD developed if incidence of disease is noted to be increasing overtime.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research

Strategy 5 – Engage community and stakeholders in swift parrot conservation

ACTION		Priority	Performance Criteria	Partners
5.1	Undertake training and awareness programs on swift parrot threats and management for land managers, regulators, biological consultants and natural resource management practitioners.	1	• Training and awareness programs developed and/or updated • Training provided to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research FPA
5.2	Disseminate educational material on threats and management of swift parrot habitat	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research FPA
5.3	Engage indigenous landholders where appropriate to undertake Recovery Plan related activities.	1	• Indigenous landholders engaged and involved in swift parrot recovery plan activities.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research

Strategy 6 – Coordinate, review and report on recovery process

ACTION		Priority	Performance Criteria	Partners
6.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research

Commented [MS15]: We play a major role in this. Are running two field days as we speak for foresters, policy makers, fire service, consultants, DPIPWE etc.
Run courses bi-annualy which cover swift parrot information and also run an Annual Research Update for anyone who is interested.

Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from:
http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Front Cover: Swift Parrot. (© Copyright, Chris Tzaros).

Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2030, measure and sustain a positive population trend (compared to 2020 baseline counts) in the number of mature individuals of the Swift Parrot.

By 2030, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Manage and protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery process.

Criteria for success:

This recovery plan will be deemed successful if, by 2030, all of the following have been achieved:

- The Swift Parrot population has increased from 2020 baseline counts, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Commented [A1]: This implies that an increase by a single bird would represent success. It is suggested that a more meaningful measure is "a positive ongoing population trend".

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team includes individuals from relevant government agencies, non-government organisations, industry groups and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to be undertaken to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014). Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across mainland jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimates of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in knowledge and scientific evidence (Webb et al. 2019). Now that the Swift Parrot is Critically Endangered, urgent action is needed to meet the conservation needs of the species. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues in spite of extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats of habitat loss and alteration and Australia's changing climate. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly restricted to the east and south-east coast of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of Blue Gum on the west coast of Tasmania near Zeehan, and on both King and Flinders Islands (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for The Action Plan for Australian Birds 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no other recent estimates of population size.

While the current population size might be uncertain, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018), compounding and in addition to other known threats including habitat loss and alteration. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were shown to be absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015).

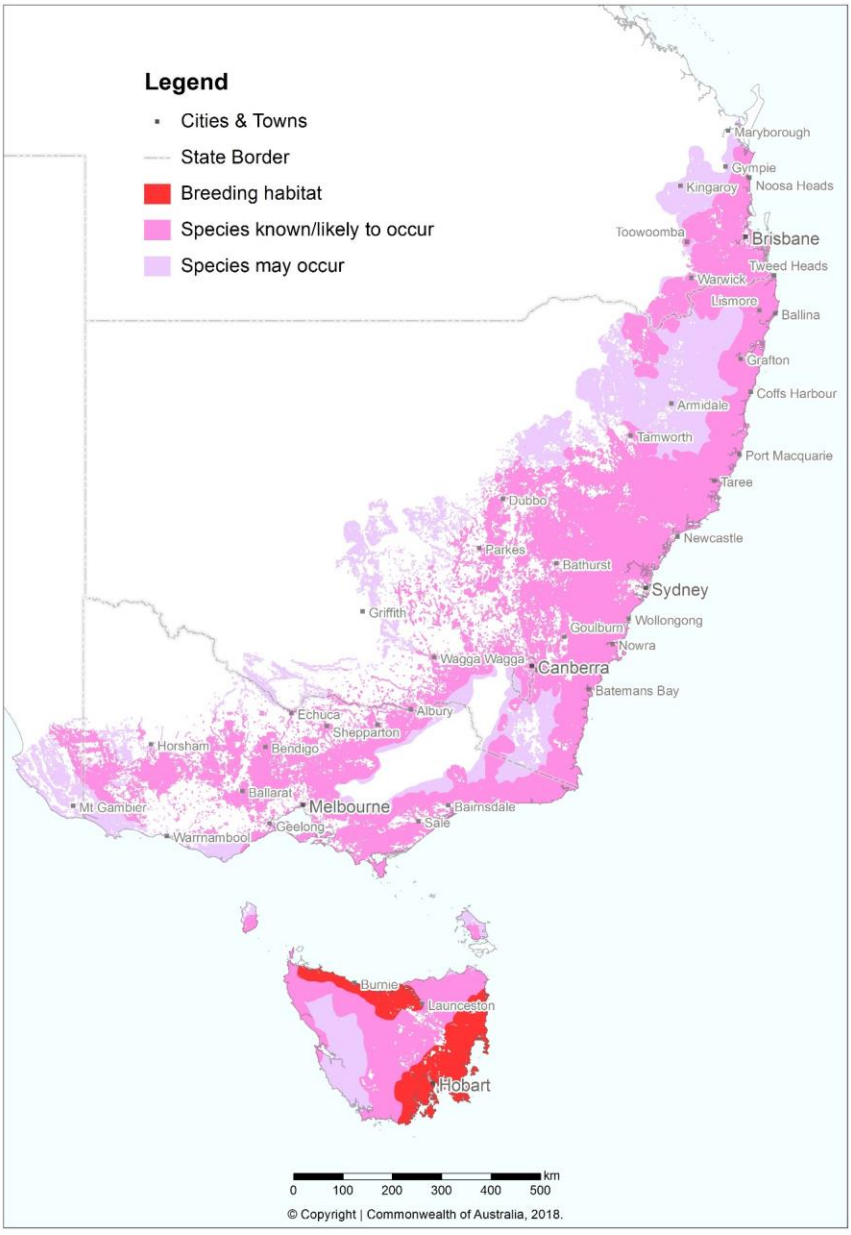

Figure 1 - Distribution of the Swift Parrot in Australia

Commented [A2]: Replace with map depicting evidence-based and expert-reviewed boundaries already defined for Tasmania – see provided Shape Files.

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Swift Parrots are known to rely heavily on lerp for food. Lerps are protective covers made by nymphs (larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005). Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40cm, 40-50cm and 50-60cm DBH) to ensure continuity of food resources over time.

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including some offshore islands, with some sporadic breeding occurring in the north of the state (Figure 1). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in any eucalypt forest that supports suitable tree hollows, provided that a suitable food source is within foraging range. The most common tree species used by Swift Parrots for nesting are Stringybark (*E. obliqua*), White Peppermint (*E. pulchella*), Blue Gum, White Gum (*E. viminalis*), Gum-topped Stringybark (*E. delegatensis*) and dead stags. The majority of recorded nest sites occur in dry Stringybark forest and wet Stringybark forest, dry White Peppermint forest and dry Blue Gum forest. Nest sites have also been recorded in other dry and wet eucalypt forest types.

Swift Parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast. Swift Parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are

typically characterised by having a diameter at breast height of around 100 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, based on the DBH of identified nest trees, most are likely much older than this.

Commented [A3]: In Tasmania we use 100cm for wet forest, 70cm for dry forest

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of Blue Gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017).

Blue Gum forests in the south-eastern and eastern region of Tasmania are considered to be a vital component of the species' breeding habitat. In areas where Blue Gum forests are scarce or do not occur, or years when flowering is poor in this forest type, other communities where Blue Gum is subdominant are important foraging habitats (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) (Webb 2014; 2017). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide an important local food resource in some years. Black Gum forest is an important foraging resource early in the breeding season and in years when flowering of Blue Gum is generally poor (Brown 1989; Brereton 1997; Swift Parrot Recovery Team 2001). In the north-west, Black Gum forest may represent the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season Swift Parrots can often be seen feeding on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and introduced eucalypts. The relative importance of other food sources during the breeding season is not well understood.

Post-breeding habitat is considered to mainly occur in the wetter forests in west and north-west Tasmania where summer and autumn flowering eucalypt species are abundant, particularly Stringybark, White-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*) and Cabbage Gum (*E. pauciflora*) (Swift Parrot Recovery Team 2001). The Swift Parrot will also forage on the flowers of Smithton Peppermint (*E. nitida*) in the south-west and west of the state.

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes are involved in the search for suitable nest hollows which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs

but up to five may be laid. During incubation the male visits the nest site every three to five hours to feed the female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

2.7 Key biodiversity areas

The Key Biodiversity Areas (KBA) approach helps to identify and designate areas of international importance in terms of biodiversity conservation using globally standardised criteria (BirdLife International 2020). KBAs extend the Important Bird Area concept to other taxonomic groups and are now being identified in many parts of the world, by a range of governmental and non-governmental organisations. Defining, protecting and managing KBAs will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity.

The identification of a site as a KBA is unrelated to its legal status. However, its status will often inform KBA delineation, because KBAs are defined as pragmatically as possible; if an existing designation roughly matches a KBA, it will generally be used for the KBA. Many KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs; the identification of a site as a KBA simply implies that the site should be managed in ways that ensure the persistence of the biodiversity elements for which it is important (particular species or habitats). For more information on KBAs visit - http://www.keybiodiversityareas.org/home

KBA Factsheets, including boundary maps are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). BirdLife Australia have identified 18 Key Biodiversity Areas as being important for Swift Parrot conservation and to support the long-term maintenance of the species. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Brisbane Water has its origin at the confluence of the Narara and Coorumbine Creeks, to the south–east of Gosford and travels for approximately 18 kilometres in a southerly direction to its mouth at Broken Bay, about 7 kilometres from the Tasman Sea, at Barrenjoey Head. In 2009, over 110 bird species were recorded within the estuary. Some 2,277 hectares (5,630 acres) of Brisbane Water is classified as KBA because it has an isolated population of up to ten breeding pairs of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.
- Capertee Valley – The Capertee Valley is a 2nd largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. One of the most prominent features of the valley is Pantony's Crown, a sandstone butte that is now part of

the Gardens of Stone National Park. Parts of the valley are also included in the Wollemi National Park, the second-largest national park in New South Wales. The only population centre of any kind is the village of Glen Davis, which includes a camp-site and often serves as a starting-point for bushwalks around the Capertee River and other parts of the Wollemi National Park. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.

- Hastings-Macleay – The Hastings-Macleay KBA is a 1148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. It is bounded on the west by the Pacific Highway. It combines ephemeral floodplain wetlands with coastal swamp forests. It is mostly cattle-grazed but contains large blocks of state forest, protected areas and tea-tree plantations. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot, Regent Honeyeater and the Endangered Australasian Bittern, and probably over one percent of the global population of Sharp-tailed Sandpipers.

- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton state forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 square kilometres and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 square kilometres, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees,

especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The lakes and their immediate surrounds, including the Munmorah State Conservation Area and most of the Wyrrabalong National Park, have been identified as a KBA because the shallow waters have extensive seagrass beds attracting large numbers of waterbirds, including one percent of the global population of Sharp-tailed Sandpiper and Chestnut Teal. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods which are likely to support the species in years when the Spotted Gums are not flowering. Also included are large areas of pasture between forest blocks, and small areas of agriculture and urban development which contain scattered large flowering trees and remnants of native vegetation in otherwise anthropogenic landscapes. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 1,100 (or 50 percent of the global population) non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters. It also supports small numbers of Painted Honeyeaters, Diamond Firetails and Flame Robins (*Petroica phoenicea*). Declining woodland birds still present in the KBA include Brown Treecreepers (*Climacteris picumnus*), Speckled Warblers (*Pyrrholaemus sagittatus*), Hooded Robins (*Melanodryas cucullata*), Grey-crowned Babblers (*Pomatostomus temporalis*), Gilbert's Whistler (*Pachycephala inornata*) and, occasionally, migrant Black Honeyeaters (*Sugomel nigrum*). Crested Bellbirds (*Oreoica gutturalis*) are locally extinct.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 (89,000-acre) island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the world's

largest population of the Endangered Forty-spotted Pardalote, up to a third of the global population of the Swift Parrot, all 12 of Tasmania's endemic bird species, and up to 240,000 breeding pairs of the Short-tailed Shearwater.

- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Swift Parrots and Endangered Forty-spotted Pardalotes, over one percent of the global population of Pacific Gulls, as well as populations of most of Tasmania's endemic bird species.
- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare (829,720-acre) KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula. The area has been identified as a KBA because it contains almost all the breeding habitat of the Swift Parrot on the Tasmanian mainland, and several populations of the Endangered Forty-spotted Pardalote.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

Habitat critical to the survival for the Swift Parrot includes:

Breeding habitat

- ~~All~~ Native forest and woodland containing Blue Gum (*E. globulus*) and Black Gum (*E. ovata*) ~~forests and woodlands~~ within known breeding areas. Known breeding areas are areas containing known nest records and areas deemed as important for breeding by species specialists.

- All known ~~or potential~~ nest trees, as well as forest and woodland containing potential nesting trees within the known breeding areas~~, and within dry Stringybark forest, wet Stringybark forest, dry White Peppermint forest and dry Blue Gum forest having a diameter at breast height of around 100 cm or greater~~. Potential nesting trees typically contain hollows, have a large trunk diameter at breast height, and have signs of senescence (i.e. contain dead wood).

Mainland foraging habitat

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*) having a diameter at breast height of 60 cm or greater.

~~*Habitat for the long-term maintenance of the species*~~

- ~~All Key Biodiversity Areas identified for Swift Parrot.~~

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. It is essential that the protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering habitat loss, alteration or significant impacts to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots.

THREATS

3.1 Historical causes of decline

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011), and over 90 percent of Black Gum forest (Department of Environment and Energy 2018) that provides important foraging habitat during the breeding season has been cleared.

Commented [A4]: There are other forest types that also critical breeding habitat. Also perhaps decrease DBH in appropriate forest types to be more conservative.

DM to suggest changes in track changes.

Commented [A5]: KBAs are not necessary in this section. They are areas, not habitat. All breeding habitat within the potential breeding range is important for the long term maintenance of the species.

Commented [A6]: The RP states that the population is small. Consideration should be given to including "loss of genetic diversity" and "inbreeding depression" as potential threats.

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and sitting females. The dominate threats on the mainland include habitat loss from land clearing, forestry, agriculture and urban development. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. Preventing, reducing and managing threats is the primary focus of this recovery plan.

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; reduce the impact of Sugar Glider predation; better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is far from secure (Saunders and Russell 2016).

3.2.1 Habitat loss and alteration

Forestry and land clearing

Habitat loss through land clearing for plantation development and intensive native forest silviculture poses the greatest threat to survival of the Swift Parrot population (Webb et al. 2017; Webb et al. 2019). Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017). Recent estimates of forest harvesting in the identified Southern Forests Swift Parrot Important Breeding Area in Tasmania suggests that between 1997 and 2016 approximately 33 percent of all native eucalypt forest was converted to plantation or disturbed through native forest harvesting, and 23 percent of the identified old growth forest was no longer old-growth as a result of disturbance (Webb et al. 2018). As nesting hollows generally only occur in trees older than about 100 years of age, and larger trees have proportionally more nectar and food resources, the ongoing harvesting of breeding and foraging habitat in established native forests remains a significant threat to the species' persistence in the wild.

In Tasmania, the forests that the Swift Parrot breed in are subject to management arrangements under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act. RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the *Tasmanian Forest Practices Act 1986*, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, intended to provide a stream-lined ~~risk assessment~~management process for threatened species in the context of wood production (FPA 2014).

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Management arrangements have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al. 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested wet forests were part of breeding habitat for Swift Parrots, particularly during periods when Blue Gum flowering was poor in dry forests (Webb 2008; Law et al. 2000). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority 2014). Since Swift Parrot breeding habitat is poorly reserved in the National Reserve Network in Tasmania there is considerable reliance on the measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas is urgently required to refine and ensure the effectiveness of these measures.

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas may fail to produce the necessary food resources in one year, which may lead to rapid population decline due to the accumulated extinction debt. That is, before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The harvesting of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, for forestry reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from urban land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing

residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015).

In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. In many places, the fires burnt with high intensity. The full impact of the 2019-20 bushfires has yet to be determined. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted. This type of event is increasingly likely to reoccur as a result of climate change. Also more frequent hazard reduction burns in response to increased bushfire risk represents a potential threat to the Swift Parrot and its habitat.

Residential and industrial development

Urban, rural residential and industrial developments pose a substantial threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for ‘human safety reasons’, including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Mortality risks to Swift Parrots from window-strike and from flying into fences (Hingston 2019) has also been documented previously and represents an ongoing threat to the species in urbanised areas.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding areas. However, predation on the nest by Sugar Gliders on the mainland of Tasmania is now considered to be the most significant short-term threat to the species, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al. 2015). Stojanovic et al. (2014) also found that on the Tasmanian mainland, modelled survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and showed that the likelihood of Sugar Glider predation decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). Maria and Bruny Islands remain free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining their Sugar Glider-free status is critical for the conservation of Swift Parrots in Tasmania.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly situated (Barrios and Rodriguez 2004). Individuals may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat during a key life stage. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from large, aggressive honeyeaters, Noisy Miners (*Manorina melanocephala*) and Rainbow Lorikeets (*Trichoglossus*

haematodus) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed, fragmented (Stojanovic, D. unpublished data) or impacted by climate change.

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could prove to have irreversible impacts on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland and extreme wildfires.

Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot is a unique species that is valued internationally and domestically by bird keepers and breeders and may be particularly susceptible to such illegal activities. The extent of such activities and their impact on the wild population are currently unknown.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, the accumulation of not only threats, but impacts from a single threat increase the overall risk of extinction. For example, repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline. When assessing threats to the Swift Parrot, combinations of threats and impacts need to be considered to provide a realistic assessment of impacts on the species.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2030, measure and sustain a positive population trend (compared to 2020 baseline counts) in the number of mature individuals of the Swift Parrot.

By 2030, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objectives

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Manage and protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery process.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

Commented [A8]: Given the predicted rate of decline to extinction we would recommend inclusion of an action in here to undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population to guard against extinction in the wild and allow for reintroductions to occur.

This is a key lesson learned from the Orange-bellied parrot experience.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa
1.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
1.3	Maintain a free and openly available database for population, habitat and distributional data	2	• A free and openly available central repository for reporting monitoring observations has been identified • Relevant government databases have been maintained and updated on a regular basis • Databases have been integrated to capture	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions	$50,000 pa

			national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	BirdLife Australia	
1.4	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to inform management actions and priorities	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000

Strategy 2: Manage and protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
2.1	Identify known breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa

			• New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available		
2.2	Secure Tasmanian and Commonwealth Government commitment to support strategic planning for Swift Parrot breeding habitat	1	• The completion of the Public Authority Management Agreement (PAMA, under the TSPAct 1995) has occurred between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests • Annual ~~Monitoring~~ monitoring has occurred and an ongoing review of the implementation and effectiveness of the current management recommendations has been undertaken • Recommendations from the ongoing review have been considered and implemented • An agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years has been completed and implemented	**Australian Government** **Tasmanian Government** **Sustainable Timbers Tasmania**	Core government business

2.3	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business
2.4	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture) through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan	**Australian Government** **State governments** **Local government**	Core government business

2.5	Enhance the quality and extent of existing breeding habitat in Tasmania	1	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa
2.6	Regulate firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat • Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** **Private landholders**	$75,000 pa
2.7	Develop agreements with local government and government agencies that aim to maintain and enhance Swift Parrot breeding habitat	2	• Management agreements have been developed with local government and state government agencies which maintain and enhance Swift Parrot breeding habitat • Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat	**State governments** **Local government** **NRM regional bodies** Private landholders	$150,000 pa

2.8	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
2.9	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified • Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	**Australian Government** **State governments** **Local government** **NRM regional bodies** Private landholders BirdLife Australia NGOs	$150,000 pa
2.10	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia	$250,000 pa

				NGOs	

Strategy 3: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
3.1	Determine Sugar Glider density across Swift Parrot breeding areas	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped • A management strategy has been developed to manage Sugar Glider population at important sites, such as regularly used breeding areas • The strategy includes actions that address increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000 pa
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$50,000 pa

			density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	Academic institutions	
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions • An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000
3.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
3.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Glider		• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed	**Tasmanian Government** **NRM regional bodies**	$75,000 pa

	introduced to Maria and Bruny Islands		but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response protocols to eliminate Sugar Gliders on Maria and Bruny Islands	**Research agencies** NGOs Academic institutions	
3.8	Undertake regulatory reform of Sugar Glider protected wildlife status	1	• Sugar Gliders have been removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 • The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core governmen t business

Strategy 4: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
4.1	Continue population monitoring programs in the breeding range	1	• Existing monitoring programs have continued throughout the life of this plan, with a focus on identifying important nesting and foraging areas • Monitoring outcomes are reported annually to the relevant stakeholders and the National Recovery Team	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$125,000 pa

				Academic institutions	
4.2	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management • Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
4.3	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy such but not limited to eucalypt flowering patterns, patterns of availability in all food resources (i.e. including lerp) and climate variability	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa

			• New knowledge has been incorporated into management interventions		
4.4	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$75,000 pa
4.5	Use climate modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for sites where appropriate (i.e, through new conservation reserves, national parks etc) • A monitoring program has been established investigate the relationship between climate change and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

Strategy 5: Monitor and manage other sources of mortality.

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	3	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
5.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000
5.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease outbreaks has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders**	$50,000

				BirdLife Australia NGOs	
5.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
5.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the internet • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that target land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

Strategy 7: Coordinate, review and report on recovery process

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• Membership of the National Swift Parrot Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level. • ~~National Swift Parrot~~The Recovery Team continues to operate under agreed Terms of Reference • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in	**Recovery Team**	Core government business

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			accordance with national best practise guidelines • The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the affected organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$200,000	$200,000	$200,000	$200,000	$350,000	$1,150,000
Strategy 2	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 3	$455,000	$425,000	$475,000	$425,000	$425,000	$2,205,000
Strategy 4	$475,000	$475,000	$725,000	$475,000	$475,000	$2,625,000
Strategy 5	$50,000	$125,000	$50,000	$50,000	$50,000	$325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$60,000	$30,000	$30,000	$40,000	$190,000
TOTAL	$2,680,000	$2,755,000	$2,950,000	$2,650,000	$2,810,000	$13,845,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact on agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in BirdLife Australia coordinated annual surveys for Swift Parrots. Involvement can provide social benefits with community members and engaged groups having a sense of achievement,

inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular through the summer breeding season. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers, from a range of different organizations, to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment for a minimum of three months between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the survival of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and made publicly available. The review will determine the performance of the plan. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or

- whether a recovery plan is no longer necessary for the species as either conservation advice will suffice, or the species are removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

January 2019

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered nesting sites or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population trajectory is positive.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to be undertaken to improve the species' long-term viability. This recovery plan supercedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no estimates of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar

Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

Table 1**:** *National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (*Tasmania*)	Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable

2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

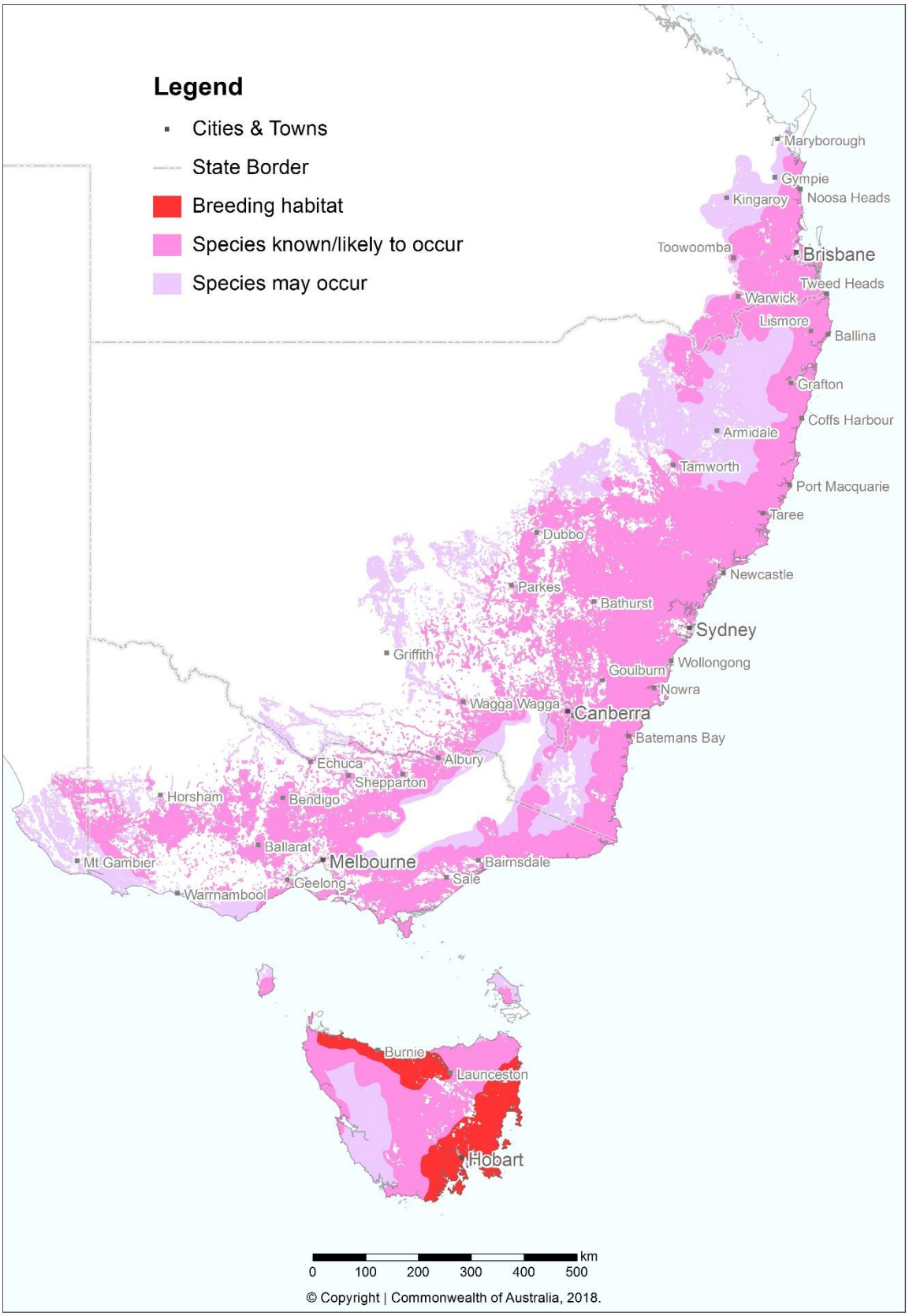

Figure 1 - Distribution of the Swift Parrot in Australia

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots spend the winter on mainland Australia and nest in Tasmania over summer. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculate*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The distribution of Swift Parrots across the landscape will vary depending on the flowering of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering

patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast. Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height of around 100cm, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, based on the DBH of identified nest trees most are likely much older than this.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017).

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered breeding or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and sitting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). Recent estimates of clearing in the identified Southern Forests Swift Parrot Important Breeding Area in Tasmania suggests that between 1997 and 2016 approximately 33% of all eucalypt forest was lost through conversion of native forest to plantation or disturbed through native forest harvesting, and 23% of the identified old growth forest was lost (Webb et al. 2018). As nesting hollows generally only occur in trees older than about 100 years of age, and that larger trees have proportionally more nectar and food resources, the ongoing logging of breeding habitat remains a threat to the species' persistence in the wild.

In Tasmania, the forests that the Swift Parrot breed in are subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999) and operations undertaken as part of the RFA do not need to be assessed against the provisions in the Act. Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, intended to provide a stream-lined risk assessment process for threatened species in the context of wood production (FPA 2014).

The agreed procedures refer to measures to protect Swift Parrot breeding habitat. These measures have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested that wet forests were part of breeding habitat for Swift Parrots, particularly during periods when E. globulus flowering was poor in dry forests (Webb 2008; Law et al. 2000). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority, 2014). Since Swift Parrot breeding habitat is poorly reserved (in formal CAR reserve system) in Tasmania there is considerable reliance on the measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas (Koch and Munks, 2018 in press) is urgently required to refine and ensure the effectiveness of these measures.

Logging of foraging habitat on the Australian mainland also remains a threat. The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial logging operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Mortality risks to Swift Parrots from window-strike has also been documented previously and represents and ongoing threat to the species in urbanised areas.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding areas. However, predation on the nest by Sugar Gliders on the mainland of Tasmania is now considered to be as significant a threat to the species as habitat loss, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). Stojanovic et al. also found that on the Tasmanian mainland, survival of Swift Parrot nests was a function of mature forest cover in the surrounding landscape and suggested that the likelihood of sugar glider predation decreased with increasing forest cover. While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research BirdLife

Strategy 2: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat.	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations. • Recommendations from ongoing review considered and implemented. • Completion and implementation of an agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years. • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests.	DoEE DPIPWE STT FPA
2.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research

2.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture) through local, state and Commonwealth Government legislation.	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	DoEE DPIPWE OEH DEHP DELWP
2.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide foraging habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research BirdLife NGOs
2.5	Regulate firewood collecting	1	• Quantify the extent of illegal firewood harvesting in breeding habitat. • Enforcement action targeted at reducing illegal firewood harvesters. • Certification system introduced for legal firewood harvesters to demonstrate wood is harvested in accordance with codes of practice.	DPIPWE
2.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
2.7	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented.	OEH DEHP DELWP

			• Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	
2.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP BirdLife NGOs
2.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP BirdLife NGOs

Strategy 3: Reduce impacts from Sugar Gliders at breeding sites

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	Research

3.5	Further investigate the possible link between forest condition, Sugar Glider density and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DPIPWE Research BirdLife
3.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key locations over the breeding season. • Strategy implemented.	DPIPWE Research
3.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DPIPWE Research BirdLife
3.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
4.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan,	Research

			with a focus on identifying key nesting and foraging areas.	
4.2	Undertake fine-scale mapping of breeding habitat to inform management.	1	• Fine-scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine-scale management.	Research
4.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season. • Winter survey program implemented on an annual basis over the life of this recovery plan.	Research BirdLife OEH
4.4	Better understand site use, landscape use and habitat bottlenecks.	2	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad-scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research BirdLife OEH DELWP
4.5	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies.	2	• Existing knowledge of breeding success, survival and mortality expanded. • Research to include focus on establishing effectiveness of recovery plan actions.	Research
4.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	Research BirdLife

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP BirdLife Research
5.3	Encourage appropriate building design and tree plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas.	DPIPWE BirdLife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web. • Informative displays are developed to educate the community.	BirdLife Research
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate.	2	• Maintain a network of volunteers to help assist with regional surveys. • Where appropriate, provide opportunities for the citizen scientists to participate in academic research projects related to recovery actions	BirdLife Research
6.3	Engage Indigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Undertake targeted consultation with Indigenous landholders to identify ways to increase engagement in recovery plan actions.	All

			• Where appropriate, engage Indigenous groups in implementation activities.	
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Strategy 7: Coordinate, review and report on recovery process

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

Costing of this Recovery Plan will be undertaken during public consultation process.

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), Red-tailed Black Cockatoo (*Calypthorhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the

assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat will impact on some landowners, managers and developers. These restrictions may not significantly impact on agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. The management of forestry operations is carried out under the provisions of the Regional Forest Agreements, with the management prescriptions being developed and implemented by State Governments and the associated forestry managers.

A large network of community volunteers across eastern Australia actively participate in BirdLife Australia coordinated annual surveys for Swift Parrots. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular through the summer breeding season. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organisations, to categorise ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan.

The review will be coordinated by the Department of the Environment and Energy in association relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment and Energy

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania – DPIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations
Swift Parrot Recovery Team

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National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

January 2019

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered nesting sites or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population trajectory is positive.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to be undertaken to improve the species' long-term viability. This recovery plan supercedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no estimates of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar

Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

Table 1**:** *National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (*Tasmania*)	Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable

2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

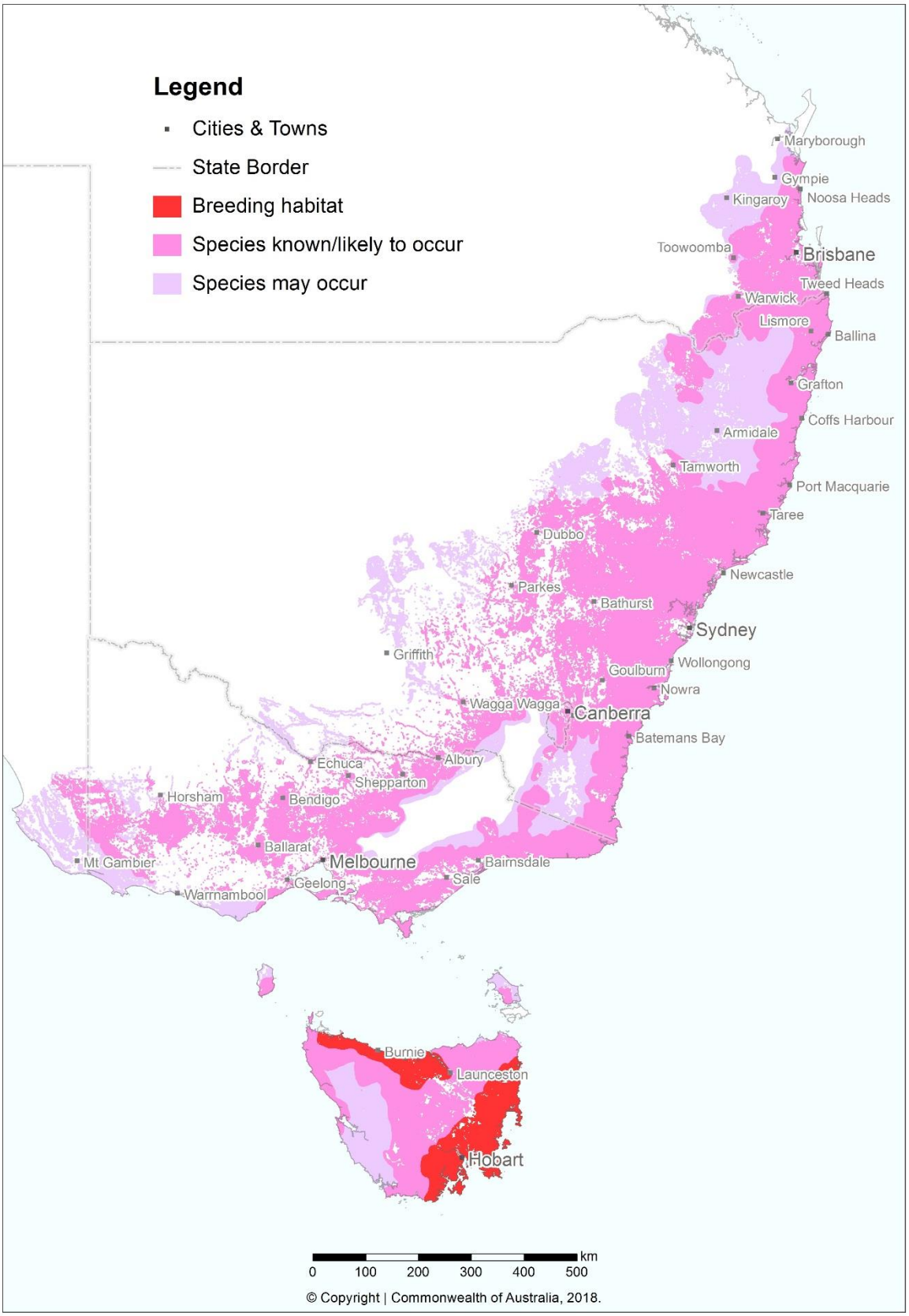

Figure 1 - Distribution of the Swift Parrot in Australia

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots spend the winter on mainland Australia and nest in Tasmania over summer. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculate*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The distribution of Swift Parrots across the landscape will vary depending on the flowering of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering

patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast. Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height of around 100cm, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, based on the DBH of identified nest trees most are likely much older than this.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017).

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered breeding or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and sitting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). Recent estimates of clearing in the identified Southern Forests Swift Parrot Important Breeding Area in Tasmania suggests that between 1997 and 2016 approximately 33% of all eucalypt forest was lost through conversion of native forest to plantation or disturbed through native forest harvesting, and 23% of the identified old growth forest was lost (Webb et al. 2018). As nesting hollows generally only occur in trees older than about 100 years of age, and that larger trees have proportionally more nectar and food resources, the ongoing logging of breeding habitat remains a threat to the species' persistence in the wild.

In Tasmania, the forests that the Swift Parrot breed in are subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999) and operations undertaken as part of the RFA do not need to be assessed against the provisions in the Act. Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, intended to provide a stream-lined risk assessment process for threatened species in the context of wood production (FPA 2014).

The agreed procedures refer to measures to protect Swift Parrot breeding habitat. These measures have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested that wet forests were part of breeding habitat for Swift Parrots, particularly during periods when E. globulus flowering was poor in dry forests (Webb 2008; Law et al. 2000). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority, 2014). Since Swift Parrot breeding habitat is poorly reserved (in formal CAR reserve system) in Tasmania there is considerable reliance on the measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas (Koch and Munks, 2018 in press) is urgently required to refine and ensure the effectiveness of these measures.

Logging of foraging habitat on the Australian mainland also remains a threat. The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial logging operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Mortality risks to Swift Parrots from window-strike has also been documented previously and represents and ongoing threat to the species in urbanised areas.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding areas. However, predation on the nest by Sugar Gliders on the mainland of Tasmania is now considered to be as significant a threat to the species as habitat loss, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). Stojanovic et al. also found that on the Tasmanian mainland, survival of Swift Parrot nests was a function of mature forest cover in the surrounding landscape and suggested that the likelihood of sugar glider predation decreased with increasing forest cover. While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research BirdLife

Strategy 2: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat.	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations. • Recommendations from ongoing review considered and implemented. • Completion and implementation of an agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years. • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests.	DoEE DPIPWE STT FPA
2.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research

2.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture) through local, state and Commonwealth Government legislation.	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	DoEE DPIPWE OEH DEHP DELWP
2.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide foraging habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research BirdLife NGOs
2.5	Regulate firewood collecting	1	• Quantify the extent of illegal firewood harvesting in breeding habitat. • Enforcement action targeted at reducing illegal firewood harvesters. • Certification system introduced for legal firewood harvesters to demonstrate wood is harvested in accordance with codes of practice.	DPIPWE
2.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
2.7	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented.	OEH DEHP DELWP

			• Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	
2.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP BirdLife NGOs
2.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP BirdLife NGOs

Strategy 3: Reduce impacts from Sugar Gliders at breeding sites

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	Research

3.5	Further investigate the possible link between forest condition, Sugar Glider density and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DPIPWE Research BirdLife
3.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key locations over the breeding season. • Strategy implemented.	DPIPWE Research
3.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DPIPWE Research BirdLife
3.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
4.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan,	Research

			with a focus on identifying key nesting and foraging areas.	
4.2	Undertake fine-scale mapping of breeding habitat to inform management.	1	• Fine-scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine-scale management.	Research
4.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season. • Winter survey program implemented on an annual basis over the life of this recovery plan.	Research BirdLife OEH
4.4	Better understand site use, landscape use and habitat bottlenecks.	2	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad-scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research BirdLife OEH DELWP
4.5	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies.	2	• Existing knowledge of breeding success, survival and mortality expanded. • Research to include focus on establishing effectiveness of recovery plan actions.	Research
4.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	Research BirdLife

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP BirdLife Research
5.3	Encourage appropriate building design and tree plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas.	DPIPWE BirdLife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web. • Informative displays are developed to educate the community.	BirdLife Research
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate.	2	• Maintain a network of volunteers to help assist with regional surveys. • Where appropriate, provide opportunities for the citizen scientists to participate in academic research projects related to recovery actions	BirdLife Research
6.3	Engage Indigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Undertake targeted consultation with Indigenous landholders to identify ways to increase engagement in recovery plan actions.	All

			• Where appropriate, engage Indigenous groups in implementation activities.	
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Strategy 7: Coordinate, review and report on recovery process

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

Costing of this Recovery Plan will be undertaken during public consultation process.

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), Red-tailed Black Cockatoo (*Calypthorhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the

assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat will impact on some landowners, managers and developers. These restrictions may not significantly impact on agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. The management of forestry operations is carried out under the provisions of the Regional Forest Agreements, with the management prescriptions being developed and implemented by State Governments and the associated forestry managers.

A large network of community volunteers across eastern Australia actively participate in BirdLife Australia coordinated annual surveys for Swift Parrots. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliable seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular through the summer breeding season. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organisations, to categorise ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan.

The review will be coordinated by the Department of the Environment and Energy in association relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment and Energy

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania – DPIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations
Swift Parrot Recovery Team

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6 Objectives and strategies

Vision

- To implement management measures to ensure the wild population of swift parrots increases over time, to a point where it is no longer considered critically endangered

Recovery plan objectives:

- The size of the wild swift parrot population has grown, as demonstrated by direct observation or an index of abundance.
- A demonstrable improvement in the management of swift parrot breeding and foraging habitat has occurred

Recovery Plan strategies:

1. Improve understanding of foraging and breeding habitat use, and population trajectory
2. Manage and protect swift parrot habitat
3. Reduce impacts from sugar gliders at breeding sites
4. Monitor and manage other sources of mortality
5. Engage community and stakeholders in swift parrot conservation
6. Coordinate, review and report on recovery process

7 Actions to achieve specific objectives

Actions identified for the recovery of the swift parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the swift parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the swift parrot.

Priority 3: Action is desirable, but not critical to the recovery of the swift parrot or assessment of trends in that recovery.

Strategy 1 – Improve understanding of habitat use and population trajectory

ACTION		Priority	Performance Criteria	Partners
1.1	Continue to undertake fine scale mapping of breeding habitat to inform management	1	• Monitoring program continued throughout the life of this plan, with a focus on identifying key nesting and foraging areas. • Where possible, nest tree locations identified, mapped and entered into database to assist with fine scale management.	Research
1.2	Continue research on breeding success, survival and mortality.	2	• Existing knowledge of breeding success, survival and mortality expanded • Research to include focus on establishing effectiveness of recovery plan actions.	Research
1.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH
1.4	Better understand site use, landscape use and habitat bottlenecks	2	• Key winter foraging sites identified and documented. This includes sites identified in Section XX and any new sites identified through Action 1.3. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research Birdlife OEH DELWP
1.5	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of swift parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research Birdlife
1.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the swift parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the swift parrot over the next 100 years • Consideration taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.).	Research Birdlife

Strategy 2 – *Manage and protect swift parrot habitat at the landscape scale*

ACTION		Priority	Performance Criteria	Partners
2.1	Ongoing state and Commonwealth commitment to support strategic planning for swift parrot breeding habitat in areas subject to forest practices	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System. • Recommendations from ongoing review of Tasmanian Forest Practices System considered and implemented where necessary to increase the breeding success of swift parrots • Completion of the strategic planning process in the southern forests by Sustainable Timber Tasmania and DPIPWE • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the core SE breeding range of this species.	DoEE DPIPWE STT FPA
2.2	Review and revise swift parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the swift parrot population across its range.	DPIPWE STT FPA Research
2.3	Protect areas of 'habitat critical to survival' (as described in Section X.X.X) on private land from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Developments avoided on areas of 'habitat critical to survival' for the swift parrot on private land. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the swift parrot on private land has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded in areas of habitat critical to survival provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	DoEE DPIPWE OEH DEHP DELWP

2.4	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance swift parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance swift parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving swift parrot breeding habitat.	DoEE DPIPWE OEH DEHP DELWP
2.5	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 1.4) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
2.6	Identify and protect remnants close to areas of 'habitat critical for survival' for swift parrots (as defined in section X.X).	3	• Remnants close to areas of 'habitat critical to survival' for swift parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
2.7	Incorporate swift parrot conservation priorities into covenanting and other private land conservation programs to maximise the benefits of covenants aiming to protect swift parrot breeding habitat.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs. • The extent of quality habitat protected through covenanting and other private land conservation programs is increased (e.g., through land covenants).	DoEE DPIPWE OEH DEHP DELWP FPA Birdlife NGOs Research
2.8	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide breeding habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research Birdlife NGOs
2.9	Regulate fire wood collecting		• Enforcement action targeted at reducing illegal firewood harvesters • Certification system introduced for legal fire wood harvesters ensuring timber supply sustainable.	

Strategy 3 – Reduce impacts from sugar gliders at breeding sites

ACTION		Priority	Performance Criteria	Partners
3.1	Determine sugar glider density across key swift parrot breeding areas	1	• Sugar glider density across key swift parrot breeding areas known and mapped.	Research
3.2	Test mechanisms to restrict sugar gliders from swift parrot nest hollows	1	• Sugar glider exclusion trials undertaken in key swift parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
3.3	Trial methods to reduce sugar glider density from key breeding areas	1	• Trials undertaken testing the impacts of masked owl playbacks on sugar glider density and swift parrot mortality and success. • Trials undertaken testing the impacts of directly reducing sugar glider density (through trapping and euthanizing) on swift parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of sugar gliders	1	• Improved understanding of the re-colonisation dynamics of sugar gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of sugar gliders in south-east Tasmania	Research
3.5	Further investigate the link between forest condition and predation rates	1	• Improved understanding of the link between forest cover, patch size, sugar glider density and swift parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to sugar glider management	1	• Targeted communications strategy developed that communicates why sugar glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DIPWE Research Birdlife
3.7	Reduction of sugar glider predation rates on swift parrots over the breeding season.	1	• Strategy developed to manage sugar glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce sugar glider numbers, with a particular focus on reductions at key locations over the breeding season. • Strategy implemented	DIPWE Research

3.8	Early detection, and control, of sugar glider introduction to islands	1	• Process developed and implemented to ensure early detection of sugar gliders on islands where swift parrots breed but which are currently sugar glider free. • Management plan to control sugar gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DIPWE Research Birdlife
3.9	Regulatory reform of sugar glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4 - Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Partners
4.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible via relevant web sites. • Collision mitigation strategy developed to help land managers determine appropriate mitigation measures for developments in areas where collisions are likely.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research
4.2	Encourage appropriate plantings in urban areas to discourage foraging swift parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife
4.3	Strengthen penalties for ‘taking’ threatened species in Tasmania	2	• Current penalties for taking threatened species in Tasmania strengthened.	DPIPWE
4.4	Continue to monitor for incidence of Psittcine Beak and Feather Disease	2	• Incidence of PBFD recorded during handling and monitoring of swift parrots and baseline of disease established • Management strategy for PBFD developed if incidence of disease is noted to be increasing overtime.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research
4.5	Monitor for evidence of illegal capture for aviary trade	3	• Action taken against illegal collection of swift parrots	

Strategy 5 – Engage community and stakeholders in swift parrot conservation

ACTION		Priority	Performance Criteria	Partners
5.1	Undertake training and awareness programs on swift parrot threats and management for land managers, regulators, biological consultants and natural resource management practitioners.	1	• Training and awareness programs developed and/or updated • Training provided to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP FPA Birdlife NGOs Research
5.2	Disseminate educational material on threats and management of swift parrot habitat	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	DoEE DPIPWE OEH DEHP DELWP FPA Birdlife NGOs Research
5.3	Engage indigenous landholders where appropriate to undertake Recovery Plan related activities.	1	• Indigenous landholders engaged and involved in swift parrot recovery plan activities.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs Research

Strategy 6 – Coordinate, review and report on recovery process

ACTION		Priority	Performance Criteria	Partners
6.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National swift parrot Recovery Team continues to operate under agreed Terms of Reference.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research

Australian Government
Department of the Environment

National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

June 2018

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Image credits

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Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered breeding or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known breeding and foraging habitat at the landscape scale
4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Commented [A1]: Are these defined in this plan?

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population is increasing.
- ~~An~~ A Commonwealth and Tasmanian government agreed strategic management plan ~~for forestry~~covering land use activities that impact on the swift parrot is being implemented ~~in key Swift Parrot foraging and nesting regions~~ in Tasmanian.
- The Threatened Fauna Adviser recommendations are implemented and monitored in areas covered by the Tasmanian Forest Practices System
- A PAMA between DPIPWE and STT for the management of swift parrot breeding habitat is agreed and implemented in the Southern Forests region of Tasmania
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

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2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions that need to be taken to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) regulations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on

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these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no empirical estimates of population size or equivalent indices that could be used to estimate trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it has been demonstrated that the population is likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

Table 1**:** *National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable
IUCN Red List of Threatened Species: (2017)	Critically Endangered

2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. Ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

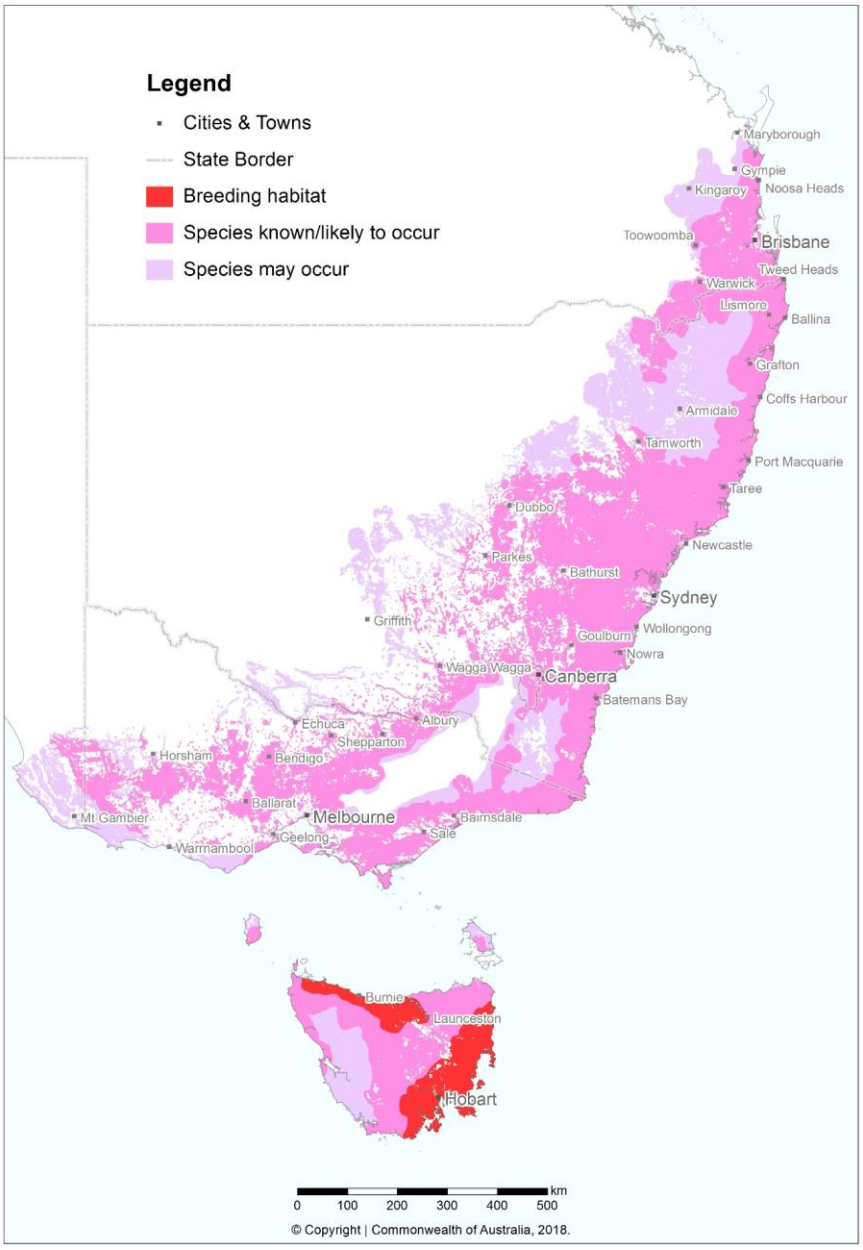

Figure 1 - Distribution of the Swift Parrot in Australia

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

Preliminary evidence now exists to support the predicted declines in population size. Unpublished data shows that between 2009 and 2015 the density of breeding Swift Parrots across the breeding range in any one year varied depending on the number of sites that were occupied i.e., the more sites used the less birds there were at any one sight. However, data from 2016 and 2017 show that this relationship might be breaking down. In those years there were generally low densities of birds across the range regardless of how many sites were being used for breeding. This is consistent with a decline in the population of breeding adults (Webb unpublished data).

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots overwinter on mainland Australia and nest in Tasmania. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculate*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

The distribution of Swift Parrots across the landscape will vary depending on the ~~flowing~~flowering of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. Ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast (Webb. Pers Comm.). Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height greater than 0.8 m, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch *et al.* 2008). However, based on the DBH of identified nest trees most are likely much older than this.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017). The protection of all nesting sites and associated foraging habitat is fundamental to the recovery of the species.

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds which are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to

five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered breeding or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, state forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and siting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting

resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and land clearing for conversion to tree plantations over the past 30 years has dramatically reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). In Tasmania, much of the forests that the Swift Parrot breed in are commercially harvested and subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999), and takes legal precedence over the EPBC Act.

~~Under the Tasmanian Forest Practices Act 1986, the management of threatened species is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code includes a set of 'Agreed Procedures' for the management of threatened species, intended to provide a stream-lined assessment process for threatened species in the context of wood production. The agreed procedures include measures to protect Swift Parrot habitat and nest trees. These procedures are currently detailed in the draft Swift Parrot Species Habitat Planning Guideline (FPA 2010).~~

Despite ~~comprehensive provisions in place to manage forestry operations in their breeding grounds,~~ the fact that the Regional Forest Agreement is supposed to be consistent with the requirements of the EPBC Act 1999, clearing or timber harvesting of swift parrot breeding habitat ~~still occurs~~followed the signing of the Agreement. Recent estimates of clearing in the identified Southern Forests Swift Parrot Important Breeding Area suggests that between 1997 and 2016 approximately 33% of all eucalypt forest was lost through conversion of native forest to plantation or disturbed through native forest harvesting and 23% of the identified old growth forest was lost (Webb et al. In press).

Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA and DPIPWE, 2014) for the management of threatened species in production forests, intended to provide a stream-lined risk assessment process for threatened species in the context of wood production. The agreed procedures refer to measures to protect Swift Parrot breeding habitat. These measures have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested that wet forests were part of breeding habitat for Swift Parrots, probably particularly during periods when *E. globulus* flowering was poor in dry forests (Webb 2008; Law et al. 2000; B. Potts pers. comm.). The current measures for the management of swift parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority, 2014). ~~Considering that~~Since swift parrot breeding habitat is poorly reserved (in formal CAR reserve system) in Tasmania there is considerable reliance on the measures

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Forest Practices Authority and DPIPWE (2014)
Procedures for the management of threatened species under the forest practices system. Forest Practices Authority and Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania

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See at
http://www.fpa.tas.gov.au/fpa_services/planning_assistance/advisory_planning_tools/threatened_fauna_advisor
Forest Practices Authority (2014) Threatened Fauna Adviser. Decision Support System. Forest Practices Authority, Hobart, Australia.

Commented [A6]: This is a bit misleading. Reads as if all the area lost or disturbed should have been protected by the management provisions. In fact there weren't any recommendations specific to the swift parrot in the southern forests until 2007. This was because the wet forest habitat was not considered a priority by specialists at the time. The 2010 planning guideline has a paragraph that explains this –
The Threatened Fauna Manual (now known as the Fauna Values Database) description of foraging-habitat previously focussed on dry forest types with a good representation of E. globulus and/or E. ovata (Brereton 1997; Swift Parrot Recovery Team 2001; FPB 2002). Since 2006, new
information has resulted in significant changes to Swift Parrot management prescriptions delivered through the Forest Practices System and to Swift Parrot breeding-habitat descriptions. It is now recognised that wet forests are part of breeding habitat for Swift Parrots, probably particularly during periods when E. globulus flowering is poor in dry forests (Webb 2008; Law et al. 2000; B. Potts pers. comm.). In the 2007/08 breeding season, the majority of recorded nesting events were in wet forests, in the eastern portion of the Southern Forests and on South Bruny Island (Webb 2008).
It took us until 2010 to get an agreed approach to protecting this habitat.
The majority of the clearing was a result of one of the outcomes of the Commonwealth/Tas gov Regional Forest Agreement. Basically because of the new reserves resulting from this agreement there was intensification allowed outside the reserves – conversion of native forest to plantation. This was not a failure of the FPA/DPIPWE 'last resort' prescriptions delivered at the FPP scale, but was a perverse outcome of the RFA 1997.
I've suggested an edit

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Forest Practices Authority and DPIPWE (2014)
Procedures for the management of threatened species under the forest practices system. Forest Practices Authority and Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania

Commented [A8]: Munks, S., Richards, K., Meggs, J. and Brereton, R. 2004. The importance of adaptive management in 'off-reserve' conservation of forest fauna: implementing, monitoring and upgrading Swift Parrot *Lathamus discolor* conservation measures in Tasmania. - In: Lunney, D. (ed.) *The Conservation of Australia's Forest Fauna* (second edition). Royal Zoological Society of New South Wales, pp. 688-698.

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delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting (Koch et al. 2018, in press) and foraging habitat availability and management approaches in off-reserve areas (Koch and Munks, 2018 in press) is urgently required to refine and ensure the effectiveness of these measures.

Nnesting hollows generally only occur in trees older than about 100 years of age, and that larger trees have proportionally more nectar and food resources. Therefore, the ongoing logging of core breeding habitat remains a significant threat to the species' persistence in the wild.

Logging of foraging habitat on the Australian mainland also remains a threat. The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial logging operations on the mainland remain unknown.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with codes of practice which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern.

Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast's pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from negative impacts associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding and drought refuge habitats. However, predation on the nest by Sugar Gliders is now considered to be as significant a threat to the species, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings. Predation by Sugar Gliders has been recorded at most mainland Tasmania sites where Swift Parrots breed. On the Tasmanian mainland, predation rates are variable and likely interact with the extent of habitat disturbance from logging and other processes, with a positive relationship between nest survival and increasing mature forest cover at the landscape scale (Stojanovic et al., 2014).

Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling

parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change is likely to pose a significant threat to the Swift Parrot. Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

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8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research Birdlife

Strategy 2: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan,	Research

			with a focus on identifying key nesting and foraging areas.	
2.2	Undertake fine scale mapping of breeding habitat to inform management	1	• Fine scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine scale management.	Research
2.3	Continue research on breeding success, survival and mortality.	2	• Existing knowledge of breeding success, survival and mortality expanded • Research to include focus on establishing effectiveness of recovery plan actions.	Research
2.4	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH

2.5	Better understand site use, landscape use and habitat bottlenecks	2	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research Birdlife OEH DELWP
2.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.).	Research Birdlife

Strategy 3: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System. • Recommendations from ongoing review of Tasmanian Forest Practices System considered and implemented to increase the breeding success of Swift Parrots • Completion and implementation of an agreed strategic management plan for forestry activities in Tasmanian that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years. • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for PTPZL in the core breeding range of the Swift Parrot.	DoEE DPIPWE STT FPA
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research
3.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments	DoEE DPIPWE OEH DEHP DELWP

Commented [A10]: Why just forest practices. This Strategic plan should cover all landuse practices that impact on habitat. We need overarching goals and direction for the whole of government. Our individual industry regulatory mechanisms can then contribute to these overarching goals.

Commented [A11]: The biggest problem here is lack of compensation funding and the lack of transparent decision making. Shouldn't all C&C proposals be assessed at the Commonwealth level rather than through our system which isn't set up to assess and mitigate C&C of threatened species habitat.

			that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	
3.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide breeding habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research Birdlife NGOs
3.5	Regulate fire wood collecting	2	• Enforcement action targeted at reducing illegal firewood harvesters • Certification system introduced for legal fire wood harvesters to ensure timber supply sustainable.	DPIPWE
3.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
3.7	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
3.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
3.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP Birdlife NGOs

Strategy 4: Reduce impacts from Sugar Gliders at breeding sites

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
4.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the impacts of directly reducing Sugar Glider density (through trapping and euthanizing) on Swift Parrot breeding mortality and success.	Research
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	Research
4.5	Further investigate the link between forest condition and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
4.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DIPWE Research Birdlife
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key	DIPWE Research

			locations over the breeding season. • Strategy implemented	
4.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DIPWE Research Birdlife
4.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research
5.3	Encourage appropriate plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web • Informative displays are developed to educate the community • Network of Volunteers maintained to help assist in regional surveys	BirdLife Research
6.2	Engage indigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Indigenous landholders engaged and involved in Swift Parrot recovery plan activities.	All
6.3	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Commented [A12]: FPA staff actually spend a lot of time doing this. See our web-site for Field days/ training programs. This is an extremely important way of getting 'change'.

Strategy 7: Coordinate, review and report on recovery process

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

This Recovery Plan will be reviewed within five years of being made and will sunset within 10.

The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible government agencies and through additional funds obtained for the explicit purpose of implementing this Plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. Whilst only Priority 1 actions are costed in this recovery plan, this shouldn't deflect from any proposal to undertake Priority 2 or 3 actions. All actions are considered important steps towards ensuring the long-term survival of the species. Core government business not costed.

Table 2: *Summary of high priority recovery actions and estimated costs in ($000's) (costs are for first five years of implementation and don't take into account inflation over time)*

	Action	Cost					
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
1.1	Develop and apply techniques to estimate changes in population trajectory.						
2.1	Continue population monitoring program in the breeding range.						
2.2	Undertake fine scale mapping of breeding habitat to inform management						
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	Core government business					
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	Core government business					
3.3	Protect areas of 'habitat critical to survival' (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	Core government business					
3.4	Enhance existing breeding habitat	Core government business					
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas						
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows						

4.3.	Trial methods to reduce Sugar Glider density from key breeding areas	
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	
4.5	Further investigate the link between forest condition and predation rates	
4.6	Develop communication strategy specific to Sugar Glider management	
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	
4.8	Early detection, and control, of Sugar Glider introduction to islands	
4.9	Regulatory reform of Sugar Glider protected wildlife status	Core government business
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	
	Total	

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), Red-tailed Black Cockatoo (*Calyptorhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Commented [A13]: Hollow dependent species in general

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the requirement to provide offset funding for research, to secure or rehabilitate habitat, or for other threat mitigation work. Any further loss of forest and woodland habitat from areas known or likely to contain Swift Parrots is regarded as significant.

Swift parrot habitat has been modified through forestry operations, clearing, development, fragmentation and degradation. The more fertile areas not used for commercial forestry

operations have been targeted for agricultural pursuits. Restrictions on further clearing of Swift Parrot habitat will impact on some landowners/managers and developers. These restrictions are not predicted to impact significantly on agricultural industries since the remnants of these forest communities are generally located on less fertile soils and are, therefore, relatively unattractive for grazing or cropping.

Public and private forestry harvesting operations remain a significant threat to the Swift Parrot. The retention of nesting areas and a suitable number of large mature trees for nectar production and to provide foraging habitat is required. Application of suitable prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot may reduce the volume of timber available for harvesting. The management of forestry operations is carried out under the provisions of the Regional Forest Agreements, with the management prescriptions being developed and implemented by State Governments and the associated forestry managers.

The Swift Parrot is a charismatic species whose plight raises awareness of the conservation problems faced by a diversity of threatened species. A large network of community volunteers across eastern Australia actively participate in Birdlife Australia coordinated annual surveys for the species. By conducting surveys in their local area, undertaking habitat restoration projects and attending educational workshops each year. Such involvement provides social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organizations, to categorize ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged or is varied to remove completed actions and include new conservation priorities
- whether a recovery plan is no longer necessary for the species because either a Conservation Advice will suffice, or the species is removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department of the Environment and Energy in association with relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania - DIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations

Commented [A14]: FPA?

15 References

Commented [A15]: I suggested some others in comments above

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Swift Parrot Recovery Actions, Performance Criteria

	Description	Performance Criteria	Comments	Priority (RP)	Priority (2016)
Action 1 *(new)*	***Reduce impact of introduced predator (sugar glider) on breeding swift parrots***		**Comment** - This is the highest priority because published modelling suggests that sugar gliders alone will drive the swift parrot population to near extinction in 16 years. Persistence of swift parrots requires landscape scale population monitoring of breeding birds, site specific monitoring of sugar glider impact, improvement of nesting habitat quality, and ultimately trialling and implementation of sugar glider control methods.		1
1.1	Survey for swift parrots across breeding range, survey for sugar glider presence, map nesting habitat and prioritise sites according to extent of sugar glider presence.	Use of camera traps and new survey methodologies at all sites used by swift parrots	**Comment** - Currently being undertaken by ANU but funding to cease in 2017 **Comment -** Currently happening on islands but boxes also deployed at other mainland sites identified in monitoring		1
1.2	Improve nesting habitat at low predation sites	Addition of nest boxes and hollows	**Comment** - Currently being undertaken by ANU but funding to cease in 2017		1
1.3	Test and implement glider eradication methodologies at prioritised sites	Trialling of efficacy of techniques, monitoring of sugar glider numbers	**Comment** - Currently being undertaken by ANU but funding to cease in 2017		1
1.4	Monitor extent/impact of sugar gliders on swift parrot mortality and breeding success	Direct monitoring of nests	**Comment** - Currently being undertaken by ANU but funding to cease in 2017		1

Action 2	***Identify the extent & quality of habitat.***				
2.1	Identify and map foraging and nesting habitat throughout the breeding range and prioritise sites.	Annual monitoring program undertaken to determine breeding distribution under different climatic conditions. Mapping and update report on distribution of nesting habitats and prioritisation completed annually. Report disseminated to relevant natural resources management and land-use planning and approvals bodies in Tasmania. Assessment of habitat loss since 1996 and pre-1760 determined for potential nesting and foraging habitat.	**Comment** - Essential for supporting Action 1 above. Currently being undertaken by ANU (since 2009) but funding to cease in 2017 **Comment -** This is important in context of annual monitoring as it identifies potential habitat bottlenecks - agree with the ranking MW has been doing this for where information exists so has to be on 'regional basis'	1	1
2.2	Identify and map foraging and roosting habitat		**Comment** - Currently being undertaken by ANU for Tasmania but funding to cease in 2017 **Comment** - Roosting habitat is a bit of an uncertain concept – it's all just habitat and is accounted for in a general monitoring approach **Comment** – records of sightings on mainland being maintained by BirdLife unfunded since 2013		1

2.2a	Identify and map foraging habitat throughout the range of the species: • Victoria – refine and update existing foraging habitat mapping (when information becomes available) and map priority sites • New South Wales – refine and update habitat mapping as more vegetation mapping becomes available, including priority sites • Queensland/ACT/SA – identify and map the extent of foraging habitat	GIS mapping on foraging habitats and priority sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 3. Review, and if necessary update, mapping by Year 5.	**Comment** - all these actions are still important, however the degree of loss of breeding habitat is at such a critical level (and ongoing) in several key locations that directing resources towards these actions will be pointless if breeding range issues are not sorted. **Comment** - It is critical that conservation action be undertaken throughout the species range. Without sufficient quality and quantity of winter habitat, the species will be unable to return to breeding area. This action is critical and relatively easily achieved by the relevant state governments using existing mapping. Each rep on the recovery team needs to contribute to the success of the program and this is one way all states can contribute rather than leaving it all up to actions in Tasmania. It is critical to understand what habitat the species has lost, what there currently is remaining and what is forecast to be available in the future. This is baseline information that is required to determine the success of conservation measures which is currently completely lacking. **Comment** - We cannot ignore mainland habitat identification and mapping. Yes Tasmania is now crucial, but with recent changes to legislation in NSW it is more important than ever to make sure we have priority mainland areas for Swift Parrots front and centre for decision makers. **Comment** - Has been undertaken for lower hunter region of NSW under research studies funded for the strategic assessment under EPBC Act - see Roderick and Ingwersen (2014) and Roderick, Ingwersen and Tzaros (2013)	2 2 1	2, 3, 1, 3, 2

			Comment - It is important to identify these habitats, but really there is no evidence to suggest that mainland wintering habitat is currently a limiting factor for the population. Although undoubtedly important, winter habitat is very unlikely to act as a bottleneck for the population when compared against the small areas in the breeding range, and therefore cannot be ranked as an equally high priority.		

2.2b	Identify and map roosting habitat throughout the range of the species with an emphasis on communal and repeatedly used roosting sites.	GIS mapping on communal and repeatedly used roosting sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 5.	**Comment** - This ties in with the identification of priority sites to guide conservation action. Previously successfully used in Victoria with the Priority sites – similar thing needs to be done for NSW in particular. **Comment** – identification of high priority regions, as has been done in Victoria, will go a long way to achieving this aim. That said – there are plenty of priority areas in Victoria which are no longer used like they used to be. **Comment** - roosting habitat is not going to be easily differentiable from other wintering habitats and this as a separate recovery action is hard to justify. The above action should account for all areas included in this action- repetitious and difficult to clearly define the difference.	3	3,3 1/2 (prioritis-ation follows identification of habitat)

2.2c	Establish habitat phenology data collection in existing research and monitoring studies, analyse findings and incorporate into recovery program.	Consult with phenology experts on the most effective and economic way to collect useful habitat phenology data relevant to Swift Parrot habitat use by Year 3. Incorporate the collection of habitat phenology data in all relevant recovery program research and monitoring studies by Year 3. Analyse and incorporate findings into recovery program	**Comment** - Work on are currently trying to make some sense of flowering phenology in Tas but it's difficult because it's quite fine scale. **Comment** - To understand habitat availability each year we need to understand habitat phenology. The amount of physical habitat vs the amount of habitat providing foraging resources each season is vastly different and will enable more effective, targeted conservation measures. **Comment** - ANU (Deb Saunders) currently developing a proposed habitat phenology project using drones to get data at correct relevant scale which could be undertaken in Tassie and on Mainland. **Comment** – The work required to undertake a phenology study on the mainland is much greater than the current pool of funds allows- to argue that the current offset money could realistically address this action on the mainland is fantasy. Current survey efforts do not address phenology, and without an investment in a much larger scale program than is currently in question, this action is very unlikely to be addressed for the mainland. The Tasmanian monitoring program already addresses phrenological questions however these relate only to the breeding period, and this is important in identifying habitat bottlenecks in context of ongoing habitat loss.	2	2,3,2 - Tas 3, 1/2 Mainland

2.3	Identify and map movement patterns throughout the range of the species.	GIS mapping on movement patterns throughout the range of the species, provided to DSEWPaC and each relevant local government and CMA by Year 5.	**Comment** - ambiguous. The important point is to understand habitat availability relative to use. **Comment** - we know nothing about a large portion of the species' life cycle, that is their migratory movements. This is important to understand given this part of the cycle is likely to have high mortality rates and major implications for the population. However previous efforts to attach long term tags on the birds to understand these movements have not been successful so until this changes this will be difficult to achieve. **Comment** - Not achievable in the immediate term at large scales, but already underway at breeding habitat in Tas**.**	2	2,3,2
Action 3	***Manage and protect Swift Parrot habitat at the landscape scale.***		**Comment** - Action dealt with under NSW Saving our Species Partnership Grant 2015/SS/0002 - Saving Our Swift Parrots and Threatened Woodland Species. **Comment** - Monitoring of breeding habitat in Tas is already achieving this goal. **Comment** – the 'NSW Saving our Species Partnership Grant 2015/SS/0002 - Saving Our Swift Parrots and Threatened Woodland Species' does not cover the Hunter Valley or the NSW south coast, so there is still need to work at broader scales than are currently being undertaken.		

3.1	Manage and protect nesting and foraging habitat.				
3.1a	Encourage and support the protection, conservation management and restoration of Swift Parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects. Relevant on-ground actions include (but are not limited to): • Retaining and expanding mature and mixed age habitat and protecting and managing it by fencing and providing a buffer zone from disturbances. • Enabling natural regeneration by fencing off and managing remnant vegetation and buffer zones to control grazing and other impacts caused by uncontrolled access (such as in urban areas). Re-vegetating areas and connecting remnant habitats by planting feed and nest tree species, fencing them off and managing them, where natural regeneration is not possible. Ongoing management of all the above fenced off areas would also be required, including pest, weed and fire management.	At least 5 incentive projects established each year for the protection, restoration or conservation management of Swift Parrot habitat. At least 5 conservation/management agreements initiated on private properties with Swift Parrot habitat by Year 5. At least 5 community project applications submitted for funding each year for the protection, restoration or conservation management of Swift Parrot habitat. Reports on the protection, restoration and management of Swift Parrot habitat provided at recovery team meetings.	**Comment -** In the breeding range this is dealt with through legislative instruments to a large degree. Private forestry operation are dealt with through the Forest Practices system. Tas Land Conservancy have covenanted several properties with swift parrot habitat **Comment** - This is not going to achieve a measurable outcome in the lifetime of the recovery plan, and if it is retained as an action, then it is the domain of NGOs etc to enact. However any such action is predicated on knowing where these activities should be directed to maximise conservation outcomes, so this falls below maintenance of monitoring as a priority. **Comment** – if direct funds were available, there are a number of regions/sites where covenants could be undertaken. We have much of this information already.	1	2,1

3.1b	Provide recommendations for the revision and update of forestry prescriptions to reflect the most recent habitat information available in Victoria and New South Wales.	Provide recommendations for revision of prescriptions for Swift Parrots when forestry licence agreements are due for renewal in each state.	**Comment -** Recommendations have been ignored by NSW government in the past despite concerted effort to change the prescriptions. Requires legislative change. **Comment -** These issues are of high priority because deforestation is an ongoing threat to the species and there is no clear adoption of the recent scientific knowledge into forest management practices, rather it appears that issues are dealt with on an ad hoc basis. This is a higher priority than the above action because protecting extant habitat is cheaper and more effective than replacing lost habitat **Comment** – with recent regressive changes in NSW shouldn't this be a high priority. It is certainly cheaper than covenanting or other mechanisms.	2	2,2,3,2

3.1c	Develop a strategic management plan for Swift Parrot breeding habitat in Tasmania. Strategic management plan for Swift Parrot to include landscape and operational level planning guidelines and prescriptions for protection of important breeding habitat. Review and update management prescriptions for Swift Parrots for use in the Forest Practices System and Local Government landuse planning and approvals processes in Tasmania.	Threatened Fauna Advisory reviewed and updated to reflect new information and recognised threats. Strategic management plan for Swift Parrot prepared and endorsed by stakeholders. A set of management prescriptions for landscape level planning and operation or development level application prepared and endorsed for use by stakeholders. Spatial data on the known and predicted occurrence of foraging and nesting resources, and important breeding areas prepared and disseminated to relevant stakeholders including Forest Practices Authority, Natural Resource Management regions and Local Governments.	**Comment** - Draft management plan currently being revised. **Comment** - This action has been partly addressed but stalled for several years, but remains a top priority. Monitoring is central to informing this plan.	1	1,1
3.1d	Provide Swift Parrot conservation information for consideration during the New South Wales. Local Government Local Environmental Planning (LEP) review process.	Swift Parrot conservation information provided to at least three key Local Government Areas for consideration during the LEP review process.	**Comment** – Lower Hunter Strategic Assessment Sustainable Regional Development research grant was been provided to Lake Macquarie City Council to help inform land use planning. Roderick, M. and Ingwersen, D.A. (2014). Swift Parrots and Regent Honeyeaters in the Lake Macquarie City Council area of New South Wales: an assessment of status, identification of high priority habitats and recommendations for conservation. Report for Lake Macquarie City Council. BirdLife Australia, Melbourne. **Comment** – work done in Lower Hunter Valley could be relatively easily adapted to other areas with appropriate funding.	2	2,2

3.2	Monitor and manage for climate change				3, 3,1/2
3.2a	Establish a climate change monitoring program to provide a basis for future adaptive conservation management.	Swift Parrot monitoring sites identified and established in association with climate monitoring stations throughout the range of the species to provide a basis for adaptive climate change conservation management plans.	**Comment** – sorting out others issues first a priority.	3	3
3.2b	Investigate the potential impact of climate change on the Swift Parrot and its habitat.	Spatial and temporal climate change models produced for the Swift Parrot based on species records, habitat mapping and bio-climatic models throughout the range of the species. Review the potential influence of climate change on the species and identify future management strategies to address this issue.	**Comment** - The previous NERP project attempted this for a whole suite of species. To generic to be of much use for swift parrots. **Comment** - The above comment highlights that specific assessments for swift parrots are required. There are many aspects of the swift parrot lifecycle that are sensitive to climate change, the importance of this should not be underestimated. NSW SOS project includes the evaluation of NSW swift parrot habitat under different climate scenarios. From initial analyses this has the potential for major implications for targeting conservation measures as habitat phenology is already changing and the birds are already responding. Critical to get a handle on this so our efforts can provide max benefit for the species. Should be of importance throughout the species' range. **Comment -** Some work has already been undertaken (Porfirio et al 2016, Emu)	1	3,2,3,1/2

Action 4	***Monitor and manage the incidence of collisions, competition and diseases.***		**Comment -** Action dealt with under NSW Saving our Species Partnership Grant 2015/SS/0002 - Saving Our Swift Parrots and Threatened Woodland Species.		
4.1	Monitor and manage the incidence of collisions				
4.1a	Establish and maintain a database for all reported injuries and deaths.	Collision database established. Ongoing maintenance of collision database as a component of the Swift Parrot Recovery Program database. Report on number and type of collisions throughout the range of the species at recovery team meetings annually.	**Comment** – There is an attempt to do this in Tas, but its pretty hard to have a positive impact. Awareness is out there, but expertise is limited. Annual monitoring suggests stochastic exposure to high risks of collisions (ie. Birds are usually in more bushland areas when breeding)	2	3,3,3
4.1b	Continue to raise public awareness of the risks of collisions and how these can be minimised. Awareness campaigns to target known high risk areas such as the greater Hobart, Melbourne and Western Sydney areas, and the central coast region of New South Wales (Wyong, Gosford, Lake Macquarie and Penrith Local Government areas).	Produce and distribute a further 5000 copies of the collision prevention brochure. Produce at least two media releases per year on collision prevention for public awareness in high risk areas.	**Comment** - Clare Hawkins (Threatened Species Zoologist, DPIPWE) does her best to maintain awareness of this issue, as well as fuel hazard reduction burning if swift parrots are present. Reliant on monitoring program **Comment** - The greatest gain from this is likely to be in the planning/approvals process so emphasis should be in this area. **Comment** - Extremely difficult to implement action, gather data and to evaluate success**.**	2	3,2,3
4.1c	Develop and distribute guidelines on collision risk management to relevant planning authorities.	Guidelines on collision risk management distributed to relevant state/territory governments, as well as local governments, NRMs and CMAs in high risk areas by Year 3.	**Comment** – potentially of low value as not likely to make much difference.	2	3,2,3

4.2	Monitor the incidence of competition from large aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources.	Establishment of monitoring program to determine the extent of competition from larger aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources, to inform management.	**Comment** - In Tasmania this is of little relevance. **Comment** - There is no data on this and difficult to change/manage throughout the range **Comment** – on the mainland Swift Parrots have been a trigger for listing Noisy Miners as a Key Threatening Process in Vic, NSW and Federally. We have good evidence they impact Swift Parrots at foraging sites.	2	3,3,2
4.3	Develop and implement a Psittacine Beak and Feather Disease management protocol.	PBFD monitoring protocol developed based on the DSEWPaC PBFD Threat Abatement Plan and distributed to all fauna rescue and State conservation organisations by Year 4. Protocol to include rescue and quarantine housing requirements for rehabilitated birds. All rehabilitated birds tested for PBFD prior to release. Details of the number of rehabilitated birds and their disease tests reported annually at recovery team meetings. Test all deceased specimens of Swift Parrots for PBFD.	**Comment** – work on on PBFD in Tas suggests it is a low priority.	3	3,3
Action 5	***Monitor population and habitat***				
5.1	Develop and implement an effective population monitoring program during the breeding season.		**Comment** - Currently being undertaken by ANU but funding to cease in 2017		1,1
5.1a	Develop an effective population monitoring program during the breeding season.	Effective population monitoring program developed and implemented.	**Comment** – currently being done but funding will cease in 2017	1	1,1
5.1b	Undertake monitoring of breeding distribution on an annual basis to develop a better understanding of the extent and number of important breeding areas in Tasmania and the relative importance of non-aggregated breeding behaviour to conservation of the Swift Parrot.	Breeding distribution maps produced following each breeding season. New and reviewed information published annually and included in the strategic management plan for the Swift Parrot	**Comment** - Ongoing. Info needs updating to some degree Several papers published related to this – and two more to come out in the next ~6 months Funds will run out in 2017.	1	1,1

5.2	Collect and analyse information on population dynamics and viability				
5.2a	Undertake research on breeding success, survival and mortality, as well as genetic structure to provide insight into currently unknown population regulation parameters.	Establishment of an ongoing research and monitoring program investigating nesting distribution and success by Year 3. Proportions of flocks containing juveniles throughout the winter range reported annually at recovery team meetings and on the web page.	**Comment**: Ongoing. Info needs updating to some degree. Funding to end in 2017. Several papers published related to this – and two more to come out in the next ~6 months	1	1,1
5.2b	Conduct population viability analysis (PVA) using data obtained from above research to provide a greater understanding of the dynamics and long-term viability of the population.	PVA conducted by Year 5, following the acquisition of essential population data.	**Comment -** First PVAs developed by ANU but need further development to a) incorporate current efforts to improve breeding, and b) improve models to reflect dynamics of flowering and sugar glider populations. Funding to cease in 2017	2	2,1
5.3	Establish and maintain coordination of volunteer surveys				
5.3a	Establish coordination of volunteer surveys throughout breeding habitats to complement existing mainland monitoring program.	Volunteer coordinator position established by Year 3 and maintained on an ongoing basis. Annual volunteer surveys conducted, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	**Comment** - Information gained from these surveys are valuable to assess distribution each winter but requires a more rigorous approach (eg. Collection of absence data, flowering conditions etc) **Comment** - Volunteer surveys have known limitations and also the results of the work are not available publically. To adequately assess whether this activity is worthwhile the data should be published before further investment is prioritised **Comments** – aren't breeding habitat surveys augmented by volunteers anymore?	1	2,2

5.3b	Maintain coordination of the existing long-term volunteer monitoring throughout mainland habitats.	Existing volunteer coordinator position maintained on an ongoing basis. Bi-annual volunteer surveys conducted across eastern Australia, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	**Comment** - These surveys are the most valuable source of information we have for the species on the mainland and are providing essential data on the species' changing use of habitat over time. This is often the key data source for protecting existing habitat and is used to guide conservation actions from community to government levels. Without these surveys, impacts on the species' winter habitat would increase. This needs to be funded fully on a long term basis. **Comment** - Agree that the winter surveys provide important information on distribution etc, but the results of this long term volunteer program are not publically available in a form that adequately explains the veracity of the data or the questions those data may be used to answer. The volunteer monitoring should be published or made available fully so that a detailed discussion of its strengths and weaknesses can be had. This will inform exactly what model of future implementation should take place **Comment** – the data may not have been distributed widely in a 'publically available form...etc' but they are available to the recovery team and have recently been shared with ANU in a way to evaluate and 'clean up' the data. If funding were available to write up the data it would happen, but for the past 4 years this has been completely unfunded. The cost of this work is not insignificant.	1	2,2,1,1

Supporting Actions for recovery plan objectives.

	Description	Performance Criteria	Status	Priority (RP)	Priority (2016)
Action 6	***Increase community involvement in, and awareness of, the recovery program.***				
6.1	Provide advice, education and support to volunteers, community members, landowners, local governments and regional NRM organisations (includes presentations and workshops).	Summary of community and landowner information and education program implementation across the range of the species provided at recovery team meetings. At least one full day community education and awareness workshop held each year. At least 5 presentations to interest groups each year. Information distributed to all relevant regional NRM organisations at least twice a year to keep them informed of the recovery program. Swift Parrot information produced and distributed to community groups, management agencies, schools and other education institutions on request.	**Comment** - In Tas a lot of this happens by default simply by having an active monitoring program operating **Comment** – across the mainland this is integrated into woodland bird workshops undertaken by BirdLife and other NGOs, and workshops will be undertaken in 2 regions under the new NSW SOS project.	2	2,3, 2 on mainland

6.2	Assess the level of indigenous interest in the recovery program by consulting relevant indigenous people and organisations that occur within the species' range.	Indigenous representatives from throughout the species range consulted to gauge their level and type of interest in the recovery program. Consultation to commence in Year 4. Given the large number of potential indigenous groups and people to consult, this process would be incremental throughout the recovery program. Updates on consultation and interest to be provided at each recovery team meeting. Indigenous parties identified as having interest in the program are included in the recovery program mailing list. Interested indigenous parties consulted to determine what involvement they would like to have, and if there is any relevant traditional knowledge available on the species or its habitats, should it be appropriate to document this knowledge for recovery program purposes.	**Comment** - This is all happening Bruny Island (Murrayfield) and its extremely important to maintain good relations. Again this is happening by default. **Comment** - Previous attempts to identify Aboriginal groups interested on the mainland didn't get much response but was not properly funded nor done in a way that may be inductive for Indigenous involvement.	2	1, 3,1,3
6.3	Produce and distribute the annual recovery program newsletter *Swifts Across the Strait.*	Newsletters produced and distributed to recovery program volunteers, community groups and NRM organisations each year.	**Comment** - This no longer occurs, but BirdLife keeps in touch with volunteers for the surveys (although I believe the surveys and newsletters are significantly underfunded) **Comment** – BirdLife provide at least 2 brief newsletter updates per year, incorporating sightings maps, but provision of a Swifts Across the Strait hasn't happened for about 5 years due to funding constraints.	2	3,3

6.4	Develop a Swift Parrot Recovery Program web page providing access to recovery plans, audio and visual identification information, survey forms, links with other conservation programs and on-line volunteer survey data entry.	Web page designed and established on the internet by Year 3. Web page reviewed, and if necessary, updated annually.	Comment – BirdLife has several pages on their website related to Swift Parrots and discussions are occurring at present to incorporate data entry into BirdLife's new bird data portal http://www.birdlife.org.au/bird-profile/swift-parrot http://birdlife.org.au/projects/woodland-birds-for-biodiversity	3	3,3
Action 7	***Coordinate, review and report on recovery process.***				
7.1	Maintain a recovery team that effectively organises, implements, reviews and reports on the recovery outcomes.	Volunteer program coordinators (Tasmania, Victoria, New South Wales), and breeding researchers (Tasmania) employed each year to implement recovery actions. Recovery team meetings held and minutes produced bi-annually, with the location allocated on a rotational basis between the range States. Recovery outcomes and resultant changes to recovery program reported bi-annually.	**Comment** – in 2015 BirdLife instigated a system using volunteer coordinators to assist in conducting the May and August mainland surveys. This is currently unfunded.	1	1
7.2	Develop and manage a central database for all data collected as part of the recovery program.	Swift Parrot recovery database (SPRD) developed and made accessible for on-line data entry on recovery program web page by Year 3. SPRD maintained and updated annually. All Swift Parrot records from SPRD provided to relevant Commonwealth, state and territory government departments and BirdLife Australia on an annual basis for inclusion in their respective atlas databases.	**Comment** - Unclear what data would need including in a central database and how it would be used. Needs discussion.	1	2,2

National Recovery Plan
for the
Swift Parrot *Lathamus discolor*

Birds Australia
CONSERVATION THROUGH KNOWLEDGE

Tasmania
Explore the possibilities

State Government Victoria
Department of Sustainability and Environment

Queensland Government

NSW GOVERNMENT
Office of Environment & Heritage

Australian Government

Government of South Australia

ACT PARKS CONSERVATION AND LANDS

National Recovery Plan for the Swift Parrot *Lathamus discolor*

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Disclaimer

The Australian Government, in partnership with Birds Australia, the New South Wales Office of Environment and Heritage, the Victorian Department of Sustainability and Environment, the Queensland Department of Environment and Resource Management, the Tasmanian Department of Primary Industries, Parks, Water and the Environment, the South Australian Department for Environment and Natural Resources and the Australian Capital Territory Department of Parks, Conservation and Lands facilitates the publication of recovery plans to detail the actions needed for the conservation of threatened native wildlife. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved, and may also be constrained by the need to address other conservation priorities. Approved recovery actions may be subject to modification due to changes in knowledge and changes in conservation status.

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Summary

This document constitutes the formal National Recovery Plan for the Swift Parrot *Lathamus discolor*. The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure its long-term viability in nature and the parties who will undertake these actions. This is the third such recovery plan, and replaces the 2001 plan.

The Swift Parrot is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and is also listed as a threatened species in each state and territory in which it occurs (New South Wales, Tasmania, Victoria, ACT, Queensland and South Australia).

Swift Parrots breed in Tasmania and migrate to mainland Australia in autumn. During winter the parrots disperse across a broad landscape, foraging on nectar and lerps in eucalypts mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland.

Based on current knowledge of the ecology and distribution of the Swift Parrot the persistence of this species is mainly threatened by loss and alteration of habitat from forestry activities including firewood harvesting, clearing for residential, agricultural and industrial developments, attrition of old growth trees in the agricultural landscape, suppression of forest regeneration, and frequent fire. The species is also threatened by the effects of climate change, food and nest source competition, flight collision hazards, psittacine beak and feather disease, and illegal capture and trade.

The overall objective of this plan is to prevent further population decline of the Swift Parrot and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. These objectives will be achieved by implementing recovery actions for each of the following specific recovery objectives:

Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures

Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

Objective 4: To monitor population trends and distribution throughout the range.

Abbreviations

ANU	Australian National University
BA	Birds Australia
CMA	Catchment Management Authority
DERM	Department of Environment and Resource Management, Queensland
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities, Commonwealth
DPIPWE	Department of Primary Industries, Parks, Water and Environment, Tasmania
DSE	Department of Sustainability and Environment, Victoria
PCL	Parks, Conservation and Land, ACT
IUCN	International Union for Conservation of Nature
NRM	Natural Resource Management
OEH	Office of Environment and Heritage, New South Wales
SADENR	Department for Environment and Natural Resources, South Australia
WWF	World Wildlife Fund (Australia)

Contents

Introduction

The Swift Parrot *Lathamus discolor* is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is also listed as a threatened species in each other state and territory in which it occurs, as detailed below:

- Tasmanian *Threatened Species Protection Act 1995* (TSP Act) (Schedule 4, Endangered)
- New South Wales *Threatened Species Conservation Act 1995* (TSC Act) (Endangered)
- Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) (Schedule 2, Endangered)
- South Australian *National Parks and Wildlife Act 1972* (NPW Act) (Schedule 7, Endangered)
- Queensland *Nature Conservation Act 1992* (NC Act) (Endangered)
- Australian Capital Territory *Nature Conservation Act 1980* (ACT NC Act) (Section 21, Vulnerable)

The Swift Parrot is also listed as 'Endangered' on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN 2004).

Under the EPBC Act, a national recovery plan is required for the Swift Parrot. This is the third recovery plan for the species with the implementation of previous plans (Brereton 1998; Swift Parrot Recovery Team 2001) providing a wealth of information and advancing the conservation of this species markedly over the past 10 years. Such achievements are documented in the *National Swift Parrot Recovery Program Achievements 1995-2004* report (Saunders 2005) and provide a basis for both ongoing and new conservation strategies identified in this plan.

Supporting information for this recovery plan and further details about the Swift Parrot are available in the *Background Document - Swift Parrot Recovery Plan* (Saunders *et al.* 2010). The background document includes a species description as well as information on breeding, dispersal and migration, and summaries of published papers on the Swift Parrot. Results from the Tasmanian population monitoring and mainland volunteer survey components of the program (1995-2008) are also provided.

New directions incorporated into this plan include focusing efforts on:

- identification and protection of breeding habitat in Tasmania
- identification and protection of priority habitats in New South Wales
- increasing survey effort and habitat conservation measures on private properties
- involvement of indigenous people in the recovery program
- identifying movement patterns throughout the species' range
- identification and protection of mass roosting sites
- identification and monitoring of the potential impacts of climate change

In addition, an important part of the recovery process is to establish and maintain a long-term population monitoring program and continue the national volunteer surveys to provide a greater understanding of population trends and habitat use by the species' throughout its range.

Distribution

The Swift Parrot breeds in Tasmania during the austral summer and the entire population migrates north to mainland Australia for the austral winter (Figure 1). They occupy habitats across all tenures, with the majority of habitats occurring outside formal conservation reserves. The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania where it occupies an area of less than 500 km^2. The breeding range closely mirrors the distribution of Blue Gum *Eucalyptus globulus* in Tasmania. The species breeds in the north-west of the state between Launceston and Smithton, however, the number of birds involved and frequency of these breeding events is not well understood. Potential breeding habitat remaining in the north-west is scarce and highly fragmented.

Whilst on the mainland the Swift Parrot disperses widely, foraging on flowers and lerps in *Eucalyptus* spp. mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region. During periods of drought in central Victoria, Swift Parrots may concentrate in coastal drought refuge habitats in New South Wales, as observed in 2002 and 2009 (Tzaros *et al.* 2009).

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia.

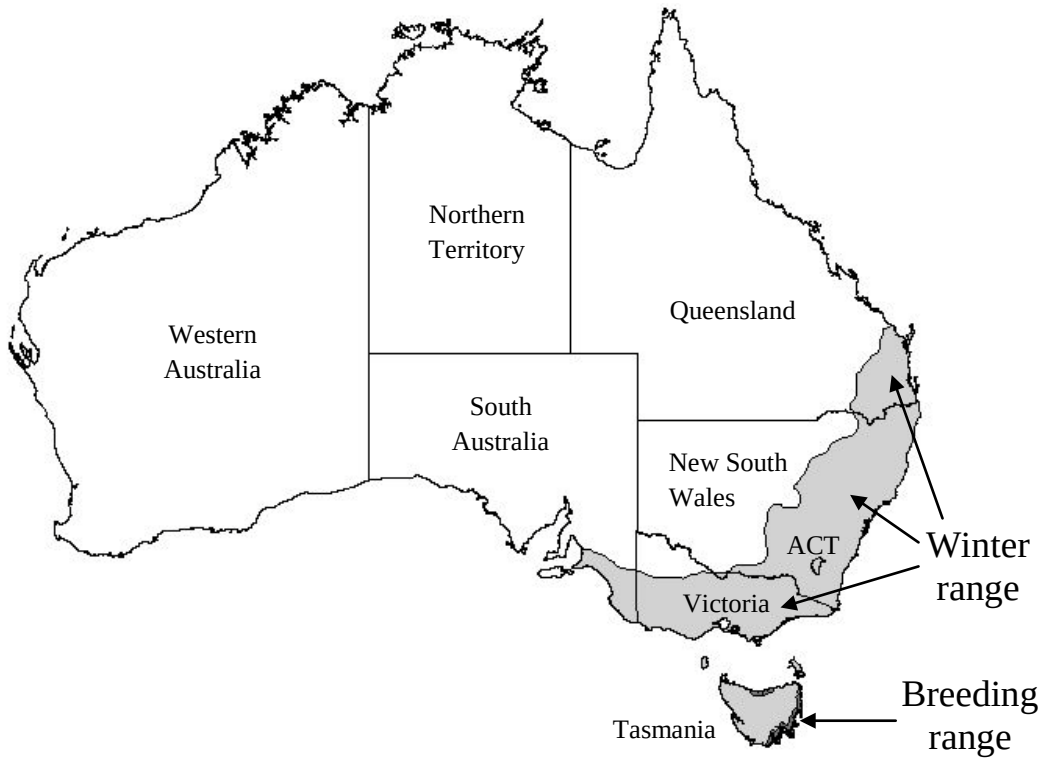

Figure 1 - Distribution of the Swift Parrot in Australia

Population

The Swift Parrot occurs as a single, migratory population. Following a significant decline in the population (from an estimated 1320 pairs in 1988, to 940 pairs in 1995) a population monitoring program was established in grassy Blue Gum forests of eastern Tasmania. This program was implemented for several years to monitor the population density of Swift Parrots and indicated that although the population is low, it is, at best, stable.

Throughout the winter range of the species, there have been 29 national volunteer surveys conducted over 15 years (1995-2009). These surveys were held twice a year (in May and August), involving hundreds of volunteers and community groups. As a result of this survey effort, volunteer experience and knowledge of habitat requirements has increased substantially.

For a summary of the population monitoring program and more information on the mainland volunteer survey results refer to the *Background Document – Swift Parrot Recovery Plan* (Saunders *et al.* 2010)

Habitat

Vegetation communities and key tree species that provide important nesting and foraging habitat for Swift Parrots are detailed below (Table 1 and 2). The use of these habitats is dependant on prevailing climatic conditions and corresponding food availability. The production of lerp and nectar food resources in these habitats and the availability of nesting hollows are considered the main limiting factors to the species' survival and capacity to breed. Due to the variable production of nectar and lerps across this species' range, it is considered important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Brereton *et al.* 2004; Kennedy and Tzaros 2005; Saunders *et al.* 2007; Saunders 2008; Tzaros *et al.* 2009). Improving the protection of nest hollow resources in proximity to foraging habitats is also an important focus of this plan.

Table 1: Swift Parrot habitats and their regional distribution in Tasmania

Habitat types - Tasmania	Key tree species scientific name	Regional distribution (NRM regions*)
Nesting Habitat		
Hollow bearing eucalypt forest	*Eucalyptus spp.*	Eastern (South, North), Northern (Cradle Coast)
Foraging Habitat (breeding)		
Blue Gum dominated forest	*Eucalyptus globulus*	Eastern (South, North)
Black Gum dominated forest	*Eucalyptus ovata*	Eastern (South, North), Northern (Cradle Coast)
Forest types where Blue Gum occurs as sub-dominant	*Eucalyptus globulus*	Eastern (South, North)
Forest types where Black Gum occurs as sub-dominant	*Eucalyptus ovata*	Eastern (South, North)
Foraging Habitat (post-breeding)		
Range of *Eucalyptus* species including *E. delegatensis, E. dalrympleana, E. obliqua, E. pauciflora* and *E. viminalis*		Eastern (South, North), Northern (Cradle Coast)

Table 2: Swift Parrot habitats and their regional distribution on mainland Australia

Foraging habitat types – mainland		Regional distribution (natural resource management regions)			
Key tree species – common name	**Key tree species – scientific name**	**Victoria**	**New South Wales/ACT**	**Queensland**	**South Australia**
Yellow Gum	*Eucalyptus leucoxylon*	Central and Western (North Central, Glenelg Hopkins, Wimmera)			South-east (South-east, Murray Darling Basin, Adelaide & Mt Lofty Ranges)
Red Ironbark	*Eucalyptus tricarpa*	Central (North Central)			
Mugga Ironbark	*Eucalyptus sideroxylon*	North-east (North East, Goulburn Broken)	Western Slopes and Central Coast (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir, Hawkesbury - Nepean)		

Foraging habitat types – mainland		Regional distribution (natural resource management regions)			
Key tree species – common name	**Key tree species – scientific name**	**Victoria**	**New South Wales/ACT**	**Queensland**	**South Australia**
Grey Box	*Eucalyptus microcarpa*	Central, North-east and West (North Central, North East, Goulburn Broken, Wimmera)	Western Slopes and Central Coast (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir, Hawkesbury - Nepean)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary)	South-east (South-east, Murray Darling Basin, Adelaide & Mt Lofty Ranges)
White Box	*Eucalyptus albens*	Central, North-east (North Central, Goulburn Broken, North East)	Western Slopes (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir)		
Yellow Box	*Eucalyptus melliodora*	Central, North-east, South, West (Wimmera, Glenelg Hopkins, Port Phillip Westernport, North Central, West Gippsland, Goulburn Broken, North East)	Western Slopes (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir) ACT (Murrumbidgee)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary	
Swamp Mahogany	*Eucalyptus robusta*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)	South-east (Burnett Mary, South East Queensland)	
Forest Red Gum	*Eucalyptus tereticornis*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary)	
Blackbutt	*Eucalyptus pilularis*		Coastal (Hunter - Central Rivers, Northern Rivers, Hawkesbury - Nepean)		
Spotted Gum	*Corymbia maculata*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)		

- Maps of natural resource management regions are provided at http://www.nrm.gov.au/nrm/region.html .

Nesting habitat (Tasmania)

The Swift Parrot nests in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 10 km of the coast. In northern Tasmania nest sites have been found much further inland in the Gog Range (Swift Parrot Recovery Team 2001). The most common tree species used by Swift Parrots for nesting are Stringybark *Eucalyptus obliqua,* White Peppermint *Eucalyptus pulchella,* Blue Gum *Eucalyptus globulus,* White Gum *Eucalyptus viminalis,* Gum-topped Stringybark *Eucalyptus delegatensis* and dead stags. The majority of recorded nest sites occur in Dry *E. obliqua* forest and Wet *E. obliqua* forest, Dry *E. pulchella* forest and Dry *E. globulus* forest. Nest sites have also been recorded in other dry and wet eucalypt forest types. In general, the prevalence of hollows in eucalypt forests and woodlands and their proximity to a foraging resource is considered more important than forest type and/or tree species. Existing nest records are likely to be a reflection of availability of these forest types and tree species rather than preference. Similarly, the more common occurrence of nest records on upper slopes and ridge tops (Brereton 1997) may be largely attributed to the distribution of hollows across the landscape resulting from past land use practices (e.g. land clearance and timber harvesting). Where suitable hollows are available, nest sites can be found in all topographic positions (Webb *et al.* in prep).

Swift Parrots select trees and forest patches with a high number of hollows (Voogdt 2006). Nesting hollows used by Swift Parrots are found predominantly in older growth trees located in forest patches of greater than 100 hectares (Brereton 1997). Nest trees are typically characterised by having a diameter at breast height greater than 0.7 m, several visible hollows and showing signs of senescence (Brereton 1997).

The distribution of nesting Swift Parrots each breeding season is largely determined by the distribution and intensity of Blue Gum flowering across the breeding range. Where there is good Blue Gum flowering in association with abundant tree hollows aggregations of up to 50 nesting pairs covering over 100 hectares have been recorded (Webb 2008). Reuse of nesting sites recorded over several different years highlights the importance of these areas to the species. Reuse of individual nest hollows by Swift Parrots has also been recorded. The presence of a foraging resource will determine whether an area is suitable on a year to year basis. Monitoring of Blue Gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east (Webb in prep) suggests that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas. These variations in Blue Gum flowering have a strong influence over the availability of potential nesting habitat from year to year. The protection of aggregated nesting sites and associated foraging habitats is important to the recovery of the species.

Important forest types within the breeding range for nesting habitat are listed in Table 1. This list should not be considered exclusive and, as mentioned above, the proximity of suitable nest hollows to a foraging resource is considered more important than forest type or tree species. Priority sites in Table 3 are not an exhaustive list and the viability/quality of some known breeding sites is unclear due to a lack of knowledge of habitat loss and disturbance within these areas.

Foraging habitat – breeding (Tasmania)

During the breeding season, Swift Parrots are strongly associated with Blue Gum *Eucalyptus globulus* dominated forests and woodlands where they feed on the nectar from the flowers of these eucalypts (Brereton 1997). There is considerable inter-annual variation in the flowering intensity of Blue Gums in Tasmania (Brereton *et al.* 2004; Mallick *et al.* 2004). Flowering varies both spatially and temporally across the landscape. A lack of hollow bearing forest in some areas may result in areas of potential foraging habitat not being available for nesting birds.

Blue Gum forests in the south-eastern and eastern region of Tasmania are considered to be a vital component of the species' breeding habitat. In areas where Blue Gum forests are scarce or do not occur, or years when flowering is poor in this forest type, other communities where Blue Gum is subdominant are important foraging habitats (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) (Webb in prep). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide an important local food resource in some years. Black Gum *E. ovata* forest is an important foraging resource early in the breeding season and in years when flowering of Blue Gum is generally poor (Brown 1989; Brereton 1997; Swift Parrot Recovery Team 2001). In the north-west Black Gum forest may represent the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton *et al* (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season Swift Parrots can often be seen feeding on lerps, wild fruits such as Native Cherry *Exocarpos cupressiformis* and introduced eucalypts. The relative importance of other food sources during the breeding season is not well understood.

Foraging habitat – post-breeding (Tasmania)

Post-breeding habitat in Tasmania has not been studied in detail and current information is based on opportunistic observations. Post-breeding habitat is considered to mainly occur in the wetter forests in west and north-west Tasmania where summer and autumn flowering eucalypt species are abundant, particularly stringybark *E. obliqua*, White-topped Stringybark *E. delegatensis*, White Gum *E. viminalis*, Mountain Gum *E. dalrympleana* and Cabbage Gum *E. pauciflora* (Swift Parrot Recovery Team 2001). The Swift Parrot will also forage on the flowers of Smithton Peppermint *Eucalyptus nitida* in the south-west and west of the state.

Foraging habitat – autumn-winter (mainland Australia)

During the winter migration period, the majority of the population frequents eucalypt woodlands and forests in Victoria and New South Wales. Research within winter habitats has identified key foraging habitat types and characteristics as detailed in Table 2 (Kennedy 2000; Mac Nally and Horrocks 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005; Saunders and Heinsohn 2008). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law *et al.* 2000).

Although Swift Parrots have been recorded in a wider range of habitats than those provided in Table 2, some of these are considered to be used opportunistically rather than providing a reliable quantity and quality of resources upon which the species can depend. For example, planted eucalypts are sometimes used by this species opportunistically when natural foraging resources are scarce. Although the species can adapt to utilise such a variety of habitats, the prolonged use of such habitats and co-existence with aggressive species that tend to inhabit disturbed areas may be energetically expensive and reduce overall fitness and survival of the species. Contributing factors may include reduced food quality, increased distance travelled in search of food, increased competition from large, aggressive bird species and/or increased exposure to collision hazards in the built environment.

In Victoria habitat mapping has focused on public land throughout the box-ironbark regions and 40 priority sites have been identified where Swift Parrots have a high level of site fidelity, or have occurred in large flocks (Saunders *et al.* 2007). An additional 121,000 hectares of box-ironbark forests and woodland have been added to the state's national parks and reserves system, with the majority of the priority sites now within these reserved areas (Environment Conservation Council 2001). The focus of work in central Victoria is now on mapping habitats on private land and incorporating this with existing public land mapping for a more complete picture of habitat availability and use by Swift Parrots (Saunders *et al.* 2007).

In New South Wales, habitat mapping has been limited by the availability of suitable vegetation mapping with some areas of the species' range not currently mapped. Due to the highly fragmented nature of some Swift Parrot sites in New South Wales, some important habitats, such as those within coastal urban environments, are not evident from vegetation mapping alone. Therefore Swift Parrot records need to be combined with vegetation mapping to get a clearer indication of habitat use in New South Wales. Prioritisation of New South Wales sites is currently being undertaken; however this is primarily on public land. Therefore further work is needed to survey and identify sites on private properties. The majority of Swift Parrot foraging sites in New South Wales, Queensland and South Australia occur outside conservation reserves and therefore continue to be vulnerable to loss, fragmentation or disturbance.

Many of the Swift Parrot foraging sites in Queensland occur on council reserves or parkland. The Regional Ecosystems containing preferred Swift Parrot forage tree species have been mapped and overlaid for the recorded areas of Swift Parrots in Queensland.

Priority habitats

Of particular importance for conservation management are habitats which are used:

- for nesting,
- by large proportions of the Swift Parrot population,
- repeatedly between seasons (site fidelity), or
- for prolonged periods of time (site persistence).

Site fidelity is considered to be important for the long-term survival of migrants at both breeding and non-breeding sites (Villard *et al.* 1995). Information obtained through the recovery program demonstrates the importance of site fidelity for the Swift Parrot population (Kennedy and Tzaros 2005). However, the importance of areas where site fidelity has not yet been established should not be dismissed since this may be due to observational and accessibility limitations and long-term resource availability cycles (Saunders *et al.* 2007).

Table 3: Priority habitat for conservation management of Swift Parrot nesting and foraging resources.

State	Priority sites/regions
Tasmania	East coast: Potential and known breeding habitat (i.e. foraging and nesting) on the east coast between Cockle Creek and the Gardens within approximately 10 km of the coast. Between Sorell and Orford this area extends to within 15 km of the coast. Known breeding sites include but are not limited to Maria Island, Mt Wellington and surrounds, Meehan Range, Tasman Peninsula, Wielangta, the D'Entrecasteaux Channel area including Bruny Island, Nelsons Tier, Tinderbox, Chain of Lagoons to Binalong Bay and Southern Forests. North West Coast: Known sites include Gog Range, Kelcey Tier, Badger Range, Mt Careless, Round Hill, Dial Range.
Victoria	Local/Regional/State parks: Bendigo Regional Park, Dookie Bushland Reserve, Muckleford Historic and Cultural Reserve, Paddy's Ranges State Park, Warby Ranges State Park. Nature Conservation Reserves/National Parks: Big Tottington, Chiltern-Pilot, Crosbie, Dalyenong, Deep Lead, Dunach, Havelock, Heathcote-Graytown, Illawarra, Jallukar, Moliagul, Morrl Morrl, Pilchers Bridge, Shelbourne, Spring Plains, Stoney Creek, Timor, Tunstalls. State Forests: Costerfield, Diamond Dam, Glynwylln, Havelock, Illawarra, Kingower, Lockwood South, Maldon, Mount Hooghly, One Eye, Redcastle, Rushworth, Sandon, Sedgwick, St Arnaud, Timor, Waanyarra, Wareek.
New South Wales	Priority sites to be identified within the following CMAs: Hawkesbury - Nepean, Hunter - Central Rivers, Lachlan, Murray, Murrumbidgee, Northern Rivers, Southern Rivers, Sydney Metro.
Queensland	South-east Queensland: Brisbane - Bowman Park, Bardon; Rafting Creek Reserve Kenmore/Fig Tree Pocket. Toowoomba - Glen Lomond Park

Conserving a combination of known priority habitat and potential habitat in perpetuity in different regions is essential for the long-term survival of the Swift Parrot. Habitat critical to the survival of the Swift Parrot includes; those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team. Actions 1.1, 1.2, 2.1, 2.2 and 4.2 are expected to elicit information that further defines the ecological characteristics and spatial distribution of habitat critical to the survival of the Swift Parrot.

Roosting habitat

Roost site characteristics, and the importance of such sites for the Swift Parrot, are relatively unknown. Roost sites have been recorded in Victoria, New South Wales and Tasmania. Recent observations of mass roosting events suggest that roosting sites may play an important role in facilitating social interactions and communication and may be used repeatedly within and between seasons. Vegetation structure and proximity to foraging sites are likely to be important for roost site selection however further information is required to identify these habitat components and their importance for the species.

Movement pathways

Movement pathways used by Swift Parrots throughout their range are not well understood given observations of such events are rare and tracking individuals over long distances is not currently possible with existing satellite tracking technology. Although large scale movement trends have been demonstrated across mainland Australia (Saunders *et al. in prep*), it is not known if long distance movements across Bass Strait or on the mainland are undertaken in groups, nocturnally or diurnally, at specific heights or what triggers such movements. Further information is required to identify potential movement pathways, the importance of such pathways and potential threats that occur in these areas.

Threats

Major threats to the survival of the Swift Parrot population include the loss and alteration of foraging and nesting habitat through forestry activities, including firewood harvesting, and residential, industrial and agricultural development. Other identified threats include climate change impacts, competition for foraging and nesting resources, mortality from collisions with human-made objects, Psittacine beak and feather disease, and illegal bird capture and trade. These threats are described in more detail below.

Habitat loss and alteration

Habitat loss through land clearing for plantation development and intensive native forest silviculture poses the greatest threat to survival of the Swift Parrot population. The clearance of foraging and nesting habitat has been extensive and dramatic in many areas reducing the available nesting and foraging habitat to small remnants of what previously existed (Prober and Thiele 1995; Saunders *et al.* 2007). Twenty ecological communities providing potential habitat for Swift Parrots have been listed as endangered or vulnerable (Table 4), and in Tasmania important foraging habitat including grassy Blue Gum forest and Black Gum forest are recognised as threatened vegetation communities. Habitat loss and alteration also occurs through residential, agricultural and industrial development, and dieback in agricultural and urban areas.

Forestry activities including firewood harvesting

Forestry activities, including firewood harvesting result in the loss and alteration of nesting and foraging habitat throughout the Swift Parrot's range. In Tasmania, in the absence of adequate management prescriptions, foraging and nesting habitat in wet forest types has been particularly prone to loss and alteration by forestry activities. Habitat loss from forestry activities occurs from either conversion to plantation or from intensive native forest silviculture.

Firewood collection is a threat to nesting habitat in Tasmania and foraging habitat on mainland Australia. Trees targeted by firewood collectors are often dead or dying trees supporting many hollows suitable for Swift Parrot nesting, or are large, mature forage trees.

In addition to habitat loss and alteration caused by forestry activities, including firewood harvesting, there is an additional risk of mortality caused by felling of trees containing active nests where operations in potential breeding habitat are undertaken during the breeding season.

The harvesting of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales for forestry reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots for foraging and that provide more reliable, as well as greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005).

Table 4: Threatened ecological communities containing habitat suitable for Swift Parrots.

	Threatened Ecological Community	*Conservation Status*	*Habitat use*	*Remaining habitat (varies regionally)*
1.	Grassy Blue Gum Forest	Threatened (Tas)	Nesting, Foraging	<30%
2.	Grassy/Shrubby Black Gum Forests	Threatened (Tas)	Nesting, Foraging	<10%
3.	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Endangered (Federal)	Foraging	<5% (<400ha unmodified in New South Wales)
4.	Box Ironbark Forest (EVC 61)	Vulnerable – Depleted (Vic)	Foraging	10-30%, 30-50%
5.	Plains Grassy Woodland (EVC 55)	Endangered (Vic)	Foraging	<10%
6.	Limestone Box Forest (EVC 15)	Vulnerable (Vic)	Foraging	10-30%
7.	Bega Dry Grassy Forest	Endangered (NSW)	Foraging	10%
8.	Cumberland Plain Woodland*	Critically Endangered (Federal and NSW)	Foraging	8%
9.	Hunter Lowland Red Gum Forest	Endangered (NSW)	Foraging	27% (<500ha)
10.	Lower Hunter Spotted Gum - Ironbark Forest	Endangered (NSW)	Foraging	<25%
11.	River-Flat Eucalypt Forest on Coastal Floodplains	Endangered (NSW)	Foraging	20-30%
12.	Shale Sandstone Transition Forests*	Endangered (Federal and NSW)	Foraging	20-40%
13.	Shale Gravel Transition Forests*	Critically Endangered (Federal and NSW)	Foraging	31%
14.	Swamp Sclerophyll Forest on Coastal Floodplains	Endangered (NSW)	Foraging	3-30%
15.	Bangalay Sand Forest	Endangered (NSW)	Foraging	20-30%
16.	White Box/Yellow Box/Red Gum Grassy Woodland	Endangered (NSW)	Foraging	1-7%
17.	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered (preliminary listing, NSW)	Foraging	15%
18.	Yellow Box/Red Gum Grassy Woodland*	Endangered (ACT)	Foraging	10%
19.	Gippsland Red Gum Grassy Woodland and Associated Native Grassland	Critically Endangered (Federal)	Foraging	1-5%
20.	Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered (Federal)	Foraging	<5%

* Recovery Plan/Action Statement prepared

Information in this table is summarised from state and federal threatened vegetation community listings, descriptions and action plans.

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, within important breeding areas in Tasmania and key areas in Victoria, New South Wales and Queensland being of particular concern. In Tasmania, the greatest potential for negative impacts is in the urban and rural residential areas of the greater Hobart area, particularly in important breeding areas. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons' (Webb pers. obs.).

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats such as those around Bendigo. In New South Wales, urban and industrial expansion on the central and north coasts pose an ongoing threat of habitat loss with an increasingly large proportion of the human population (about 86%) residing in coastal areas of Australia (Natural Resource Management Ministerial Council 2003).

In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from negative impacts associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes is forest remnants and isolated or scattered paddock trees. However this habitat continues to be lost through senescence, dieback and over grazing with limited or no recruitment. This is of particular concern in eastern Tasmania, central Victoria and on the western slopes and northern tablelands of New South Wales.

Regeneration suppression

Urban impacts, grazing and declining tree health all contribute to reduced tree regeneration in Swift Parrot habitats. By inhibiting natural regeneration these threats alter the age structure of habitats and reduce the long-term viability of foraging and nesting resources. Where natural regeneration is inhibited, the health of existing mature trees and the seed source are also reduced. This is of particular concern in nesting and foraging habitat in Tasmania, in regions of coastal New South Wales where key habitats remain predominantly as mature trees within the urban environment, and on agricultural land in central Victoria and on the western slopes and northern tablelands of New South Wales.

Frequent Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to potential Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997).

Climate change

Loss of nesting and foraging habitat from climate change, caused by anthropogenic emissions of greenhouse gases, is likely to pose a significant threat to the Swift Parrot. The Swift Parrot has been identified by Bennett *et al.* (1991) as potentially having suitable climatic conditions within its current range reduced by 50% in Victoria as a result of increased temperatures (3 degrees Celsius) due to global warming (based on bioclimatic models only). Brereton *et al.* (1995) identified the Swift Parrot as being particularly vulnerable to changes in spatial and temporal distribution of its habitats. Climate change in Australia may affect the geographic range, migration patterns, physiology and abundance of species (such as the Swift Parrot) as well as the phenology and community composition of their habitats (Chambers *et al.* 2005). Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Collision mortality

Collisions with wire netting or mesh fences windows and cars may cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are scarce due to drought, causing Swift Parrots to concentrate in urban areas to forage on remnant and planted eucalypts. With an increasingly large proportion of the human population (over 86%) residing in coastal areas of Australia (Natural Resource Management Ministerial Council 2003), urban and other built environments are expanding into areas of foraging and nesting habitat and impacts from fatal collisions are likely to increase.

Collisions are of particular concern in the greater Hobart and Melbourne areas and New South Wales Central and North Coast regions, where injuries and fatalities have previously been recorded (Tzaros 2002).

The construction of wind energy turbines in south-eastern Australia may have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift Parrots can experience increased competition for food and nesting resources from large, aggressive honeyeaters within altered habitats (Ford *et al.* 1993; Grey *et al.* 1998; Saunders and Heinsohn 2008) and introduced birds and bees (Brown 1989; Paton 1993; Hingston *et al.* 2004).

Resource competition with the introduced European Honeybee *Apis mellifera* is likely to pose a threat to the Swift Parrot with up to 2,000 tonnes of honey being produced each year from Swift Parrot foraging habitats in the Victorian box-ironbark woodlands on public land alone (Environment Conservation Council 2001). The invasive Large Earth Bumblebee *Bombus terrestris* may also compete for foraging resources with the Swift Parrot. This species is known to invade areas of breeding habitat in Tasmania and the potential introduction of this species to mainland Australia could further reduce the availability of food resources in over-wintering habitat for the Swift Parrot (Hingston *et al.* 2002; Hingston *et al.* 2004).

Swift Parrots are less likely to occur at known foraging sites as the abundance of large, aggressive nectar feeders (e.g. Noisy Miner *Manorina melanocephala* and Rainbow Lorikeet *Trichoglossus haematodus*) increases (Saunders and Heinsohn 2008). Impacts by Noisy Miner and Rainbow Lorikeet are likely to increase with further habitat loss and fragmentation that promote suitable conditions for these species to thrive.

Introduced birds such as European Starlings *Sturnus vulgaris*, and the European Honeybee are known to compete with Swift Parrots for nest hollows. The impacts and relative importance of these interactions are not well known, however, European Starlings have been notably absent from all known aggregated nesting sites (Webb pers. comm.).

Psittacine Beak and Feather Disease

Psittacine Beak and Feather Disease (PBFD) is a common and potentially deadly disease of parrots caused by a circovirus. The disease appears to have originated in Australia and is widespread and continuously present in wild populations of many Australian parrots. The potential effects of the disease on parrot populations range from inconsequential to devastating, depending on environmental conditions and the general health of the parrots (Department of Environment and Heritage 2005a). This disease could potentially have serious implications for the Swift Parrot population should the general health of these birds be reduced from stress associated with competition for nesting and food resources. In addition, the Swift Parrot population may be at increased risk of PBFD through the rehabilitation and release of injured birds back into the wild. It has been found that rehabilitated birds may remain latently infected, with the virus persisting in their livers, and therefore potentially increasing the dose of virus in the wild (Department of Environment and Heritage 2005a). A large number of lorikeets that are rescued and rehabilitated often carry the PBFD virus when released back into the wild. While PBFD is known to occur in Swift Parrots in the wild and in captive birds, the prevalence and pathogenicity of the disease is currently not known. Any fresh Swift Parrot found dead should be tested for PBFD.

Even if it is assumed that the virus can be transferred between lorikeets and Swift Parrots, there are no practical actions that can be identified to address this threat. This is because there is no capacity to control the interaction of two wild bird populations where their habitats overlap. Accordingly, actions to confirm this assumption, or to respond to this assumption, are not included in this plan.

Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act 1999 (Department of Environment and Heritage 2005b). The Swift Parrot is a unique species that is valued internationally and domestically by bird keepers and breeders and may be particularly susceptible to such illegal activities. The extent of such activities and their impact on the wild population are currently unknown.

Listed threatening processes

Threatening processes listed under legislation which are relevant to Swift Parrots and their habitats are shown in Table 5. Government jurisdictions that have prepared Threat Abatement Plans or Action Statements are indicated by an asterix (*).

Table5: Threatening processes relevant to the Swift Parrot

Listed threatening processes	State/Federal legislation
Clearing of native vegetation	Federal, NSW
Fauna habitat fragmentation	Victoria
Infection by Beak and Feather Disease (Psittacine Circoviral Disease)	Federal*, New South Wales
Introduction and spread of the Large Earth Bumblebee *Bombus terrestris*	Victoria, New South Wales
Competition from feral honeybees *Apis mellifera*	Victoria, New South Wales
Ecological consequences of high frequency fire	Victoria, New South Wales
Spread of the root-rot fungus *Phytophthora cinnamomi* causing tree dieback	Federal*, Victoria, New South Wales, Tasmania
Predation of native wildlife by cats *Felis catus*	Federal*, Victoria*, New South Wales
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	Federal, Victoria, New South Wales

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

Evaluation of performance of the previous Swift Parrot Recovery Plan

The previous National Swift Parrot Recovery Plan (2001) resulted in significant improvements for Swift Parrot conservation as a result of unprecedented spatial and temporal data collection and improved understanding and protection of the species' habitat throughout their range. Based on this information new knowledge gaps and actions have been identified and ongoing recovery efforts are moving towards a more landscape based approach to conservation for this migratory species. However all key threats to this species remain and the overall objectives of the recovery plan have not yet been achieved. That is, the species' endangered status remains and, despite some improvement in the conservation of habitats, there has not yet been a demonstrable sustained improvement in the quality of habitat to increase carrying capacity.

The 2001 recovery plan contained six specific objectives with 13 recovery actions and five recovery criteria. Although all specific objectives and recovery actions have been addressed to some extent, only one of the five recovery criteria has been fully achieved, as summarised in Table 6. The poor outcome of these recovery criteria is due to one or a combination of the following:

- some criteria operate on a time scale beyond the life of the recovery plan;
- important information on the species breeding ecology (e.g. knowledge of aggregated nesting, importance of wet forest habitats, variations in temporal and spatial flowering patterns over landscape scales, etc) was not available for much of the life of this plan;
- conflicting interests between habitat protection and socio-economic factors;
- some criteria were not measurable (e.g. quantifying the incidence of collisions and habitat loss)

Table 6: Assessment of recovery criteria in 2001 Recovery Plan

Recovery Criteria	Status
Priority habitats and sites have been identified and protected	Some progress
Management strategies to protect breeding and foraging habitat have been implemented	Some progress
The incidence of collisions is reduced	Unknown
The population density and/or extent and quality of habitat is not reduced and ideally is enhanced	Not achieved
Community based networks are maintained and a newsletter is produced	Achieved

Further details of the achievements and limitations for each of the objectives, recovery actions and recovery criteria are provided in Appendix 1. As part of the performance evaluation, each recovery action was assessed according to the performance indicator and scored between 0-3 using the following criteria:

0 No progress / cannot be assessed

1 Insufficient action to meet criteria

2 Action underway – most elements of action met or it is anticipated they will be

3 Criteria met – further action may or may not be required

Recovery objectives

The achievements of the recovery program from 1995-2009 have resulted in positive conservation outcomes for the Swift Parrot and its habitat, and have identified new directions for the ongoing conservation of this species (Saunders 2005). However, as the recovery program reveals more about the Swift Parrot ecology, knowledge gaps also become evident. The following recovery strategy aims to address knowledge gaps and ongoing conservation issues to ensure the Swift Parrot population is self-sustainable in the long term.

Overall objectives

To prevent further decline of the Swift Parrot population.

To achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity.

Recovery actions and performance criteria

The following actions are designed to achieve the overall objectives of this plan, as detailed in Table 7 and Table 8.

Recovery actions

Action 1 - Identify the extent and quality of habitat.

Action 2 - Manage and protect Swift Parrot habitat at the landscape scale.

Action 3 - Monitor and manage the impact of collisions, competition and disease.

Action 4 - Monitor population and habitat.

Supporting actions

Action 5 - Increase community involvement in, and awareness of, the recovery program.

Action 6 - Coordinate, review and report on recovery process.

Table7: Swift Parrot Recovery Actions, Performance Criteria and Potential Contributors

	Description	Priority	Performance Criteria	Potential Contributors
Action 1	*Identify the extent and quality of habitat.*			
1.1	**Identify and map foraging and nesting habitat throughout the breeding range and prioritise sites.**	1	Annual monitoring program undertaken to determine breeding distribution under different climatic conditions. Mapping and update report on distribution of nesting habitats and prioritisation completed annually. Report disseminated to relevant natural resources management and land-use planning and approvals bodies in Tasmania. Assessment of habitat loss since 1996 and pre-1760 determined for potential nesting and foraging habitat.	DPIPWE
1.2	**Identify and map foraging and roosting habitat**			
1.2a	Identify and map foraging habitat throughout the range of the species: • Victoria – refine and update existing foraging habitat mapping (when information becomes available) and map priority sites • New South Wales – refine and update habitat mapping as more vegetation mapping becomes available, including priority sites • Queensland/ACT/SA – identify and map the extent of foraging habitat	2 2 1	GIS mapping on foraging habitats and priority sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 3. Review, and if necessary update, mapping by Year 5.	DSE, OEH, DERM, PCL, SADENR.
1.2b	Identify and map roosting habitat throughout the range of the species with an emphasis on communal and repeatedly used roosting sites.	3	GIS mapping on communal and repeatedly used roosting sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 5.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
1.2c	Establish habitat phenology data collection in existing research and monitoring studies, analyse findings and incorporate into recovery program.	2	Consult with phenology experts on the most effective and economic way to collect useful habitat phenology data relevant to Swift Parrot habitat use by Year 3. Incorporate the collection of habitat phenology data in all relevant recovery program research and monitoring studies by Year 3. Analyse and incorporate findings into recovery program	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
1.3	Identify and map movement patterns throughout the range of the species.	2	GIS mapping on movement patterns throughout the range of the species, provided to DSEWPaC and each relevant local government and CMA by Year 5.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
Action 2	*Manage and protect Swift Parrot habitat at the landscape scale.*			
2.1	**Manage and protect nesting and foraging habitat.**			
2.1a	Encourage and support the protection, conservation management and restoration of Swift Parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects. Relevant on-ground actions include (but are not limited to): • Retaining and expanding mature and mixed age habitat and protecting and managing it by fencing and providing a buffer zone from disturbances. • Enabling natural regeneration by fencing off and managing remnant vegetation and buffer zones to control grazing and other impacts caused by uncontrolled access (such as in urban areas). Re-vegetating areas and connecting remnant habitats by planting feed and nest tree species, fencing them off and managing them, where natural regeneration is not possible. Ongoing management of all the above fenced off areas would also be required, including pest, weed and fire management.	1	At least 5 incentive projects established each year for the protection, restoration or conservation management of Swift Parrot habitat. At least 5 conservation/management agreements initiated on private properties with Swift Parrot habitat by Year 5. At least 5 community project applications submitted for funding each year for the protection, restoration or conservation management of Swift Parrot habitat. Reports on the protection, restoration and management of Swift Parrot habitat provided at recovery team meetings.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
2.1b	Provide recommendations for the revision and update of forestry prescriptions to reflect the most recent habitat information available in Victoria and New South Wales.	2	Provide recommendations for revision of prescriptions for Swift Parrots when forestry licence agreements are due for renewal in each state.	DSE, OEH
2.1c	Develop a strategic management plan for Swift Parrot breeding habitat in Tasmania. Strategic management plan for Swift Parrot to include landscape and operational level planning guidelines and prescriptions for protection of important breeding habitat. Review and update management prescriptions for Swift Parrots for use in the Forest Practices System and Local Government landuse planning and approvals processes in Tasmania.	1	Threatened Fauna Advisory reviewed and updated to reflect new information and recognised threats. Strategic management plan for Swift Parrot prepared and endorsed by stakeholders. A set of management prescriptions for landscape level planning and operation or development level application prepared and endorsed for use by stakeholders. Spatial data on the known and predicted occurrence of foraging and nesting resources, and important breeding areas prepared and disseminated to relevant stakeholders including Forest Practices Authority, Natural Resource Management regions and Local Governments.	DPIPWE
2.1d	Provide Swift Parrot conservation information for consideration during the New South Wales. Local Government Local Environmental Planning (LEP) review process.	2	Swift Parrot conservation information provided to at least three key Local Government Areas for consideration during the LEP review process.	OEH
2.2	**Monitor and manage for climate change**			
2.2a	Establish a climate change monitoring program to provide a basis for future adaptive conservation management.	3	Swift Parrot monitoring sites identified and established in association with climate monitoring stations throughout the range of the species to provide a basis for adaptive climate change conservation management plans.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
2.2b	Investigate the potential impact of climate change on the Swift Parrot and its habitat.	1	Spatial and temporal climate change models produced for the Swift Parrot based on species records, habitat mapping and bio-climatic models throughout the range of the species. Review the potential influence of climate change on the species and identify future management strategies to address this issue.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
Action 3	*Monitor and manage the incidence of collisions, competition and diseases.*			
3.1	**Monitor and manage the incidence of collisions**			
3.1a	Establish and maintain a database for all reported injuries and deaths.	2	Collision database established. Ongoing maintenance of collision database as a component of the Swift Parrot Recovery Program database. Report on number and type of collisions throughout the range of the species at recovery team meetings annually.	DPIPWE, DSE, OEH
3.1b	Continue to raise public awareness of the risks of collisions and how these can be minimised. Awareness campaigns to target known high risk areas such as the greater Hobart, Melbourne and Western Sydney areas, and the central coast region of New South Wales (Wyong, Gosford, Lake Macquarie and Penrith Local Government areas).	2	Produce and distribute a further 5000 copies of the collision prevention brochure. Produce at least two media releases per year on collision prevention for public awareness in high risk areas.	DPIPWE, DSE, OEH
3.1c	Develop and distribute guidelines on collision risk management to relevant planning authorities.	2	Guidelines on collision risk management distributed to relevant state/territory governments, as well as local governments, NRMs and CMAs in high risk areas by Year 3.	DPIPWE, DSE, OEH
3.2	**Monitor the incidence of competition from large aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources.**	2	Establishment of monitoring program to determine the extent of competition from larger aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources, to inform management.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
3.3	**Develop and implement a Psittacine Beak and Feather Disease management protocol.**	3	PBFD monitoring protocol developed based on the DSEWPaC PBFD Threat Abatement Plan and distributed to all fauna rescue and State conservation organisations by Year 4. Protocol to include rescue and quarantine housing requirements for rehabilitated birds. All rehabilitated birds tested for PBFD prior to release. Details of the number of rehabilitated birds and their disease tests reported annually at recovery team meetings. Test all deceased specimens of Swift Parrots for PBFD.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
Action 4	*Monitor population and habitat*			
4.1	**Develop and implement an effective population monitoring program during the breeding season.**			
4.1a	Develop an effective population monitoring program during the breeding season.	1	Effective population monitoring program developed and implemented.	DPIPWE
4.1b	Undertake monitoring of breeding distribution on an annual basis to develop a better understanding of the extent and number of important breeding areas in Tasmania and the relative importance of non-aggregated breeding behaviour to conservation of the Swift Parrot.	1	Breeding distribution maps produced following each breeding season. New and reviewed information published annually and included in the strategic management plan for the Swift Parrot	DPIPWE
4.2	**Collect and analyse information on population dynamics and viability**			
4.2a	Undertake research on breeding success, survival and mortality, as well as genetic structure to provide insight into currently unknown population regulation parameters.	1	Establishment of an ongoing research and monitoring program investigating nesting distribution and success by Year 3. Proportions of flocks containing juveniles throughout the winter range reported annually at recovery team meetings and on the web page.	DPIPWE, DSE, OEH, DERM, PCL, SADENR
4.2b	Conduct population viability analysis (PVA) using data obtained from above research to provide a greater understanding of the dynamics and long-term viability of the population.	2	PVA conducted by Year 5, following the acquisition of essential population data.	DPIPWE, OEH, DSE, ANU
4.3	**Establish and maintain coordination of volunteer surveys**			
4.3a	Establish coordination of volunteer surveys throughout breeding habitats to complement existing mainland monitoring program.	1	Volunteer coordinator position established by Year 3 and maintained on an ongoing basis. Annual volunteer surveys conducted, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	DPIPWE

	Description	Priority	Performance Criteria	Potential Contributors
4.3b	Maintain coordination of the existing long-term volunteer monitoring throughout mainland habitats.	1	Existing volunteer coordinator position maintained on an ongoing basis. Bi-annual volunteer surveys conducted across eastern Australia, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	DSE, OEH, DERM, PCL, SADENR.

Objectives and actions are listed according to subject matter, not according to order of significance

Table 8: Supporting Actions for recovery plan objectives.

	Description	Priority	Performance Criteria	Potential Contributors
Supporting Actions				
Action 5	*Increase community involvement in, and awareness of, the recovery program.*			
5.1	Provide advice, education and support to volunteers, community members, landowners, local governments and regional NRM organisations (includes presentations and workshops).	2	Summary of community and landowner information and education program implementation across the range of the species provided at recovery team meetings. At least one full day community education and awareness workshop held each year. At least 5 presentations to interest groups each year. Information distributed to all relevant regional NRM organisations at least twice a year to keep them informed of the recovery program. Swift Parrot information produced and distributed to community groups, management agencies, schools and other education institutions on request.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
5.2	Assess the level of indigenous interest in the recovery program by consulting relevant indigenous people and organisations that occur within the species' range.	2	Indigenous representatives from throughout the species range consulted to gauge their level and type of interest in the recovery program. Consultation to commence in Year 4. Given the large number of potential indigenous groups and people to consult, this process would be incremental throughout the recovery program. Updates on consultation and interest to be provided at each recovery team meeting. Indigenous parties identified as having interest in the program are included in the recovery program mailing list. Interested indigenous parties consulted to determine what involvement they would like to have, and if there is any relevant traditional knowledge available on the species or its habitats, should it be appropriate to document this knowledge for recovery program purposes.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
5.3	Produce and distribute the annual recovery program newsletter *Swifts Across the Strait.*	2	Newsletters produced and distributed to recovery program volunteers, community groups and NRM organisations each year.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
5.4	Develop a Swift Parrot Recovery Program web page providing access to recovery plans, audio and visual identification information, survey forms, links with other conservation programs and on-line volunteer survey data entry.	3	Web page designed and established on the internet by Year 3. Web page reviewed, and if necessary, updated annually.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
Action 6	*Coordinate, review and report on recovery process.*			
6.1	Maintain a recovery team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	Volunteer program coordinators (Tasmania, Victoria, New South Wales), and breeding researchers (Tasmania) employed each year to implement recovery actions. Recovery team meetings held and minutes produced bi-annually, with the location allocated on a rotational basis between the range States. Recovery outcomes and resultant changes to recovery program reported bi-annually.	DSEWPaC, DPIPWE, DSE, OEH, DERM, PCL, SADENR.
6.2	Develop and manage a central database for all data collected as part of the recovery program.	1	Swift Parrot recovery database (SPRD) developed and made accessible for on-line data entry on recovery program web page by Year 3. SPRD maintained and updated annually. All Swift Parrot records from SPRD provided to relevant Commonwealth, state and territory government departments and Birds Australia on an annual basis for inclusion in their respective atlas databases.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

Objectives and actions are listed according to subject matter, not according to order of significance.

Management practices

Where forestry operations continue to occur within foraging habitats on the mainland, logging prescriptions should include the retention of all trees 60cm DBH or greater, together with at least 5 trees per hectare from a mixture of other age classes (30-40cm, 40-50cm and 50-60cm DBH) to ensure continuity of food resources over time.

In addition to the above and the recovery actions, management practices (activities, policies and/or guidelines) that are not specifically designed for recovery of the Swift Parrot, but may still make valuable contributions, include:

- Local Environment Plan biodiversity requirements
- Natural Resource Management biodiversity targets
- Firewood harvesting codes of practice
- Forestry management prescriptions, particularly in Tasmania, Victoria and New South Wales
- Native vegetation conservation initiatives
- Management plans for conservation reserves, travelling stock reserves and other crown land
- Conservation agreements, offsets and biodiversity incentives on private properties
- Local and regional habitat protection, enhancement and rehabilitation programs
- Removal of stock and/or modification of grazing practices to enable habitat regeneration
- Commonwealth, State and Local Government land use planning for biodiversity conservation
- Australian National Greenhouse Strategy
- Draft Burnett Mary Region ‘Back on Track’ Biodiversity Action Plan
- Draft Border Rivers Maranoa-Balonne Region ‘Back on Track’ Biodiversity Action Plan

Significant impact guidelines

Under Commonwealth, State and Territory government conservation legislation, the significance of potential impacts from proposed developments/activities on threatened species and vegetation communities needs to be assessed. For the Swift Parrot, the clearance of nesting, roosting or foraging habitat may have a significant impact on the population. Such impacts are most likely to be significant where a proposal or activity may result in loss of habitat in, or adjacent to priority foraging, nesting and roosting sites (as previously defined).

Such proposals for developments/activities need to be referred to DSEWPaC under the EPBC Act and specific advice should be sought from the recovery team. Further general information on determining the level of significance under Commonwealth legislation is available at: http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html .

Affected interests

The following list provides information on key affected interests, however it should not be considered exhaustive. There may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required.

Australian government

The Swift Parrot is known or predicted to occur on several properties owned or managed by the Australian Government. Priority foraging habitat within the overwintering range of the species is found in Booderee National Park (Jervis Bay Territory), and Department of Defence lands at Beecroft Peninsula (Jervis Bay, NSW), Puckapunyal (Vic), Bandiana (Vic), Longlea (Vic), Mangalore (Vic) and Amberley (Qld). Swift Parrot breeding habitat in Tasmania reportedly occurs on Defence lands at Buckland, Pontville, Fort Direction and Anglesea Barracks. Potential habitat also occurs on the following 14 properties (over five hectares) in Western Sydney: ADI St Marys, Airservices Castlereagh, Llandilo and Badgerys Creek, ADIS Eastern Creek, Defence Holsworthy, Ingleburn, Kingswood, Londonderry, Orchard Hills and Richmond, OTC Bringelly, Schofields Aerodrome and Telstra Doonside. There may also be other Commonwealth properties with suitable habitat for Swift Parrots that have not yet been identified.

State and Territory governments

The Swift Parrot is listed as a threatened species in five states and one territory. The following conservation and land management agencies for each state/territory are responsible for the protection and management of the Swift Parrot and its habitat:

- Tasmania – Department of Primary Industries, Parks, Water and Environment, Forest Practices Authority
- Victoria – Department of Sustainability and Environment, Parks Victoria
- New South Wales – Office of Environment and Heritage, Forests New South Wales
- Queensland – Department of Environment and Resource Management
- South Australia – Department of Environment and Natural Resources
- Australian Capital Territory – Parks, Conservation and Lands

Local governments

Local governments within each of the 30 NRM regions listed in Table 9 have a responsibility to protect and manage biodiversity within their jurisdiction. Therefore there are numerous Local Government Areas (LGAs) that should consider Swift Parrots in their local environmental planning schemes. For example, within New South Wales alone, there are 138 LGAs that contain potential or known habitat for the Swift Parrot.

Indigenous people

Indigenous people, groups and landowners from across south-eastern Australia may have a cultural, social or financial interest in the conservation of Swift Parrots. Consultation with a wide range of indigenous people is required to identify what interests the Aboriginal community have in regard to Swift Parrots, and to incorporate cultural values and management practices into the plan, if culturally acceptable. Details of Indigenous people and groups that have been consulted during the development of this plan, and that may be interested in future consultation are provided in (Table 10). This includes Aboriginal Land Councils, Cultural Heritage Officers, Indigenous Protected Area managers, individuals and threatened species indigenous liaison officers. This list should not be considered exhaustive, but rather a starting point in indigenous involvement and consultation. Therefore where further indigenous people or groups express an

interest in being involved in the implementation of this recovery plan, they will also be included. All activities will be undertaken in a manner that respects the cultural traditions of aboriginal nations throughout the species' range.

Natural resource management organisations

The Swift Parrot population is distributed across 30 Natural Resource Management regions, making management throughout the range of the species challenging (Saunders *et al.* 2007). A guide to recovery actions relevant for each region is provided in Table 9, with the highest priority regions for implementation indicated by an asterix (*).

Table 9: Natural Resource Management regions and relevant recovery actions at the regional level.

State/ Territory	NRM regions	1.1	1.2 a-c	1.3	2.1 a-d	2.2 a,b	3.1 a-c	3.2	3.3	4.1	4.2 a,b	4.3 a,b	5.1	5.2	5.3	5.4	6.1	6.2
Tasmania (3)	South*	✓	✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
	North*	✓	✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
	Cradle Coast		✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
Victoria (9)	Port Phillip Westernport*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Goulburn Broken*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	East Gippsland*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	West Gippsland*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	North Central*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	North East*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Glenelg Hopkins		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Corangamite		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Wimmera		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
New South Wales/Australian Capital Territory (11)	Southern Rivers		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Northern Rivers*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓

State/ Territory	NRM regions	1.1	1.2 a-c	1.3	2.1 a-d	2.2 a,b	3.1 a-c	3.2	3.3	4.1	4.2 a,b	4.3 a,b	5.1	5.2	5.3	5.4	6.1	6.2
	Hunter - Central Rivers*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Hawkesbury - Nepean*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Sydney Metro*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murray*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murrumbidgee*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Lachlan*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Central West		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Namoi		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Border Rivers - Gwydir		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
Queensland (4)	Border Rivers Maranoa-Balonne		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Condamine		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	South East Queensland		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Burnett Mary		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
South Australia (3)	South East		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Adelaide/Mount Lofty Ranges		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murray Darling Basin		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓

Table 10. People and organisations consulted about indigenous interests and involvement during the drafting of this plan.

Name	Relevant country	Consultation
New South Wales/ Australian Capital Territory		
New South Wales Aboriginal Land Council	Within New South Wales there are 98 Local Aboriginal Land Council (LALC) areas within the range of the Swift Parrot	Recommended providing information directly to the relevant Local Aboriginal Land Councils (LALC).
New South Wales Local Aboriginal Land Councils	Of the 98 LALCs within the range of the Swift Parrot, 52 LALC areas have records of Swift Parrots and 17 contain key areas of habitat and numerous records of the species.	The following 17 key LALCs have been contacted and encouraged to share information on Swift Parrots and migratory birds for inclusion in this recovery plan. Albury And District, Awabakal, Bahtabah, Batemans Bay, Bathurst, Bega, Brungle/Tumut, Coffs Harbour, Cowra, Darkinjung, Deerubbin, Metropolitan, Mindaribba, Narrandera, Wagga Wagga, Worimi, Young.
Aboriginal Heritage Officers, New South Wales OEH	New South Wales	Liaison with Aboriginal Heritage Officers in New South Wales OEH to establish ways of generating interest and involvement in the recovery program by Aboriginal community members. All Aboriginal Heritage Officers included on the recovery program mailing list and provided with information about the recovery program including survey updates, newsletters and information about workshops that can be disseminated within their communities.
CMA Aboriginal Heritage Officers	New South Wales	All Aboriginal Heritage Officers will be included on the recovery program mailing list and provided with information about the recovery program including survey updates, newsletters and information about workshops that can be disseminated within their communities.
New South Wales threatened species recovery planning and Aboriginal community involvement pilot project	North-eastern New South Wales	The Swift Parrot has been included in a pilot project on Threatened Species consultation with Aboriginal Communities in North East New South Wales to establish the most mutually beneficial way for the Aboriginal community to be consulted in relation to threatened species recovery programs.

Name	Relevant country	Consultation
Aboriginal media	New South Wales	Articles and media releases to be provided to Indigenous media sources regarding Swift Parrot workshops and surveys. Article to encourage Aboriginal participation and awareness of the recovery program published in *Coastal Custodian* newsletter for the New South Wales South Coast Aboriginal Community.
Indigenous Protected Area managers	Proposed Gumma (Forresters Beach) IPA, New South Wales north coast (potential habitat – requires confirmation)	Consulted with Indigenous Protected Area manager
Victoria		
	Relevant Indigenous groups for Victoria need to be identified.	Relevant Indigenous groups identified need to be consulted.
Queensland		
Indigenous Protected Area managers	Guanaba Indigenous Protected Area, south-east Queensland (potential habitat – requires confirmation)	Consulted with Indigenous Protected Area manager
South Australia		
	South Australia – South-eastern and Eastern	Further consultation with the Aboriginal Partnerships Unit in SADENR needed.
Tasmania		
Tasmanian Aboriginal Land Council/ Indigenous Protected Area managers	Risdon Cove and Putalina (Oyster Cove) Indigenous Protected Areas	Indigenous Protected Area coordinators to be contacted.

Urban, rural residential and industrial developers

Swift Parrots use habitats across all land tenures, including areas proposed for urban, rural residential and industrial developments. Where such developments include clearing known or potential habitat for the Swift Parrot, threatened species impact assessments need to be undertaken in accordance with state/territory and Commonwealth legislation.

Agricultural land managers

Swift Parrots are known to occur in remnant vegetation on agricultural land. Grazing, trampling and other agricultural disturbances can impact on the health and regeneration of habitat at some sites. Exclusion of stock or changes to agricultural practices to improve the health and regeneration of habitats may affect some local interests.

Conservation land managers

There are numerous private landowners throughout the species range who manage their land for conservation purposes. These landowners are given support and encouragement to apply for funding to protect and enhance habitats suitable for the Swift Parrot and to participate in the national volunteer surveys. The Australian Bush Heritage Fund owns properties with Swift Parrot habitat and supports the

recovery program by conducting research into effective habitat rehabilitation techniques within their private reserve system and allowing property access for volunteers for the national volunteer surveys. Each state/territory government manages land for conservation, including reserves that contain habitat suitable for Swift Parrots.

Universities

The Australian National University and the University of Tasmania have ongoing involvement in research components of the recovery program and provide academic support and financial/in-kind assistance to researchers and students.

Non-government organisations

Two non-government conservation organisations have made significant contributions to the implementation of this plan. Birds Australia (BA) and the World Wildlife Fund (WWF Australia) Threatened Species Network have provided in-kind, technical and community support to ensure the effective involvement and education of community members and groups.

Community organisations

There are currently over 80 community organisations involved in the recovery program. These organisations include ornithology/bird and natural history groups as well as habitat rehabilitation (e.g. Landcare, Bushcare etc.) and wildlife care (e.g. WIRES) groups within the 30 regional catchment management areas. Such groups benefit from the implementation of this plan through support for habitat rehabilitation projects, active local involvement in a national program and the provision of information on results of surveys and other conservation activities undertaken for the species.

Biodiversity benefits

As a forest and woodland dependent bird the Swift Parrot is a high profile species associated with the conservation of such habitats in south-eastern Australia at a landscape scale. Being the only member of the genus *Lathamus*, the Swift Parrot is of high conservation significance. In addition, habitats used by Swift Parrots support a diversity of other wildlife including over 90 native bird species (Kennedy 2000; Kennedy and Overs 2001; Saunders *et al.* 2007; Saunders and Heinsohn 2008), 20 endangered ecological communities (Table 4), 38 other threatened fauna species (Table 11) and numerous threatened flora species. Many of these threatened species have been recorded as part of the Swift Parrot Recovery Program, with data collected often providing information not otherwise available (Saunders *et al.* 2007). Given this plan focuses on protecting habitat for the Swift Parrot, it is also likely to have positive implications for a diversity of non-target native species that occur within the same habitats and ecological communities that provide habitat for this species.

Social and economic considerations

The Swift Parrot is a charismatic species whose plight raises awareness of the conservation problems faced by a diversity of threatened species. A large network of community volunteers across eastern Australia actively participate in the program by conducting surveys in their local area, undertaking habitat restoration projects and attending educational workshops each year. Such involvement provides social benefits with over 750 community members and 80 community groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of indigenous cultural values. The recovery program also enables future generations to experience our rich and diverse natural heritage as

it is enjoyed today.

The Swift Parrot utilises habitat across most tenure types and therefore is subject to the management practices of a diversity of stakeholders, which have the potential to impact on the species. Although some foraging and nesting sites are contained within conservation reserves, the majority of these sites are not formally protected. Therefore activities likely to result in the loss or degradation of Swift Parrot habitat need to be prevented or restricted in order to protect the species. As a result, there may be some economic costs associated with conserving the Swift Parrot. However there are also a range of economic benefits resulting from the collaborative efforts between recovery programs to share resources and minimise costs, extensive in-kind contributions from third parties and community members providing extensive skills, time and resources voluntarily as detailed in the *Background Document* (Saunders *et al.* 2010).

The total cost of implementing the recovery plan (Table 12) is relatively economical given the high value of third party contributions (which outweigh the financial support required for recovery plan implementation), the endangered status of the species, the multi-threatened species/communities benefits, the continuation of a well established long-term monitoring program, support for regional on-ground conservation action, inclusion of world-class research and collaborations, the benefits of increasing Australia's NRM research capacity and the potential of this species to be used as an indicator of climate change impacts on the natural environment.

Table 11: Other threatened fauna species found in Swift Parrot habitats

Threatened fauna species	
Barking Owl *Ninox connivens*	*Masked Owl (Tasmanian) *Tyto novaehollandiae castanops*
Black-chinned Honeyeater *Melithreptus gularis*	*Mt Mangana Stag Beetle *Lissotes menalcas*
*Blind Velvet Worm *Tasmanipatus anophthalmus*	Northwest Velvet Worm *Ooperipatellus cryptus*
*Broad-toothed Stag Beetle *Lissotes latidens*	Painted Honeyeater *Grantiella picta*
Brown Treecreeper *Climacteris picumnus*	Pink Robin *Petroica rodinogaster*
Brush-tailed Phascogale *Phascogale tapoatafa*	*Pink-tailed Worm-lizard *Aprasia parapulchella*
Burgundy Snail *Helicarion rubicundus*	Powerful Owl *Ninox strenua*
Bush Stone-curlew *Burhinus grallarius*	Purple-crowned Lorikeet *Glossopsitta porphyrocephala*
Chestnut-rumped Heathwren *Hylacola pyrrhopygia*	*Red-tailed Black-cockatoo *Calypthorhyncus banksii graptogyne*
Diamond Firetail *Stagonopleura guttata*	*Regent Honeyeater *Anthochaera phrygia*
*Eastern-barred Bandicoot *Perameles gunnii*	Rosenberg's Goanna *Varanus rosenbergi*
*Forty-spotted Pardalote *Pardalotus quadragintus*	Speckled warbler *Chthonicola sagittata*
Giant Velvet Worm *Tasmanipatus barretti*	*Spotted-tailed Quoll *Dasyurus maculatus*
Gilberts Whistler *Pachycephala inornata*	Squirrel Glider *Petaurus norfolcensis*
Grey Goshawk *Accipiter novaehollandiae*	*Superb Parrot *Polytelis swainsonii*
Grey-crowned Babbler *Pomatostomus temporalis*	*Tasmanian Devil *Sarcophilus harrisii*
*Grey-headed Flying-fox *Pteropus poliocephalus*	Turquoise Parrot *Neophema pulchella*
Hooded Robin *Melanodryas cucullata*	*Wedge-tailed Eagle (Tasmanian) *Aquila audax fleayi*
Koala *Phascolarctos cinereus*	Yellow-bellied Glider *Petaurus australis*

* species or subspecies listed under EPBC Act as nationally threatened

Efficient and effective use of resources

In order to maximise the conservation outcomes and cost effectiveness of this plan, the actions proposed complement those of other threatened species (Table 11) and ecological community (Table 4) recovery plans, threat abatement plans (Table 5) and regional Natural Resource Management (Table 9) strategies where possible. Partnerships have also been established with several conservation programs and networks as listed below. Such partnerships assist in the recovery of multiple species and ecological communities and aim to avoid significant negative impacts to non-target native species and ecological communities.

- National Regent Honeyeater recovery program – joint survey coordination and volunteer education programs
- Birds Australia (BA) Woodland Bird Conservation Project and Threatened Bird Network – recovery program coordination, logistic and volunteer support
- New South Wales Grassy Box Woodlands Conservation Management Network – information sharing and joint education programs
- National Flying Fox recovery plan, ACT Grassy Yellow Box/Red Gum Woodland action plan – collaboration and information sharing regarding nectar resources

Plan review and evaluation

The New South Wales OEH in consultation with the Victorian DSE, Tasmanian DPIPWE, ACT PCL, Queensland DERM, South Australian DENR and the Commonwealth DSEWPaC will evaluate the performance of the recovery plan for each of the recovery actions. The Plan will be formally reviewed within five years from the date of its publication.

Implementation schedule and costs

Full implementation of the recovery program throughout the range of the species over the five years of the plan requires total funding to the value of **$4,822,352**, including in-kind contributions from government, non-government and research organisations as well as community volunteers (Table 12).

Table 12: Summary of annual funding required for implementation of the National Swift Parrot Recovery Plan.

Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Personnel	$738,714	$765,926	$781,244	$810,191	$805,682	$3,901,757
Travel	$113,450	$115,719	$118,033	$120,394	$122,802	$590,398
Equipment	$63,450	$64,719	$66,014	$67,334	$68,680	$330,197
Total (incl. GST)	$915,614	$946,364	$965,291	$997,918	$997,164	$4,822,352
Total (excl. GST)	$897,924	$928,321	$946,887	$979,146	$978,016	$4,730,293

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Appendix 1: Evaluation of achievement against specific objectives of the 2001 Swift Parrot Recovery Plan

	Specific Objective 1	**To identify priority habitats and sites across the range of the Swift Parrot**	
	Recovery Criteria 1	**Priority habitats and sites have been identified and protected**	
Action 1	**Identify the extent and quality of foraging habitat.**	**Comments**	**Score**
1a	Identify the extent and quality of foraging habitat within the overwintering range	A significantly greater understanding of winter foraging habitat requirements has been achieved through detailed ecological research and widespread volunteer surveys. This includes the identification of 40 priority sites in Victoria, essential drought refuge habitats and hundreds of sites across New South Wales as well as unprecedented information on regularity of habitat use throughout the five mainland states/territories. Importantly, the repeated and cyclic nature of habitat use by this species has been clearly demonstrated in relation to variable climatic conditions. A number of scientific publications on winter habitat use are listed in the background document (Saunders *et al.* 2010).	**2**
1b	Identify the flowering patterns of blue gum	Data collected on blue gum flowering patterns during the population monitoring program 1999-2005 suggests flowering frequency is highly variable between sites and it may be several years between significant flowering events at any one site.	**2**
	Specific Objective 2	**To implement management strategies at the landscape scale to protect and improve priority habitats and sites resulting in a sustained improvement in carrying capacity**	
	Recovery Criteria 2	**Management strategies to protect breeding and foraging habitat have been implemented.**	
Action 2	**Manage Swift Parrot habitat at a landscape scale**	**Comments**	**Score**
2a	Mapping of foraging and breeding habitat	***Tasmania*** Significant progress in the breeding range with several "new" sites/regions and/or forest types identified as providing important breeding season foraging and nesting habitat. The identification of location of aggregations of nesting Swift Parrots has led to the protection of several key sites and assisted in the identification of other potential key nesting sites and their associated foraging	**2**

		habitats. The previous plan prioritised the identification of potential breeding habitat as land clearing and harvesting of this habitat posed the greatest immediate threat. Little new data have been obtained for post breeding habitat in Tasmania. ***Mainland*** Although winter foraging habitats throughout the species' winter range have been mapped at a coarse scale, the usefulness of these maps is significantly constrained until further detailed information is available and meaningful figures on the current extent of winter habitats can be derived. Such constraints include the large number of mapping projects (over 50 different mapping projects) that have used different mapping techniques at different scales with different types of habitat information. For example, much of the current vegetation mapping does not allow accurate separation of habitats based on canopy species resulting in errors (both over and underestimations) when attempting to quantify the extent of habitat. In addition, some areas currently have no vegetation maps available.	
2b	Management and protection of habitat	***Tasmania*** Since 2001 considerable areas of two threatened forest communities have been protected through several mechanisms, including covenants, land management agreements, and management prescriptions delivered through the forest practices system. Since 2005, a better understanding of the species' breeding ecology has been incorporated into management prescriptions in production forests resulting in the retention of additional areas of potential nesting and foraging habitats that were not recognised at the inception of the 2001 plan (e.g. wet forest nesting and foraging habitats, foraging habitats where blue gum occurs as a sub-dominant species). Many of these areas would have otherwise been harvested. Recent updating of blue gum mapping including mapping of sub-dominant and wet blue gum forest within the eastern breeding range has considerably increased the area of mapped potential foraging habitat. This data will be incorporated in habitat models and used to assist in the development of a Species Strategic Plan. The overall trend in available breeding habitat in Tasmania since 2001 was downwards and most areas excluded from timber harvesting as part of Forest Practices Plans do not have formal long-term security. In 2010 an interim habitat planning guideline was developed to assist planners within the forest industry with landscape scale and operational scale management decisions. The guideline incorporates up to date knowledge of the species ecology, habitat use and distribution during the breeding season. The development of landscape scale strategic plan (Species Strategic Plan) across all land tenures is in progress. ***Mainland*** The recovery team has had regular involvement in strategies to protect Swift Parrot habitats using a range of administrative avenues, such as changes to threatened species legislation, improving vegetation clearance controls, providing recommendations for forestry	**2**

		prescriptions and development applications, and promoting private-land conservation agreements. Of particular note is the protection of 77% of the recovery program's 40 priority Swift Parrot sites on public land in Victoria. There have also been numerous community and private property projects in key areas; however, significant habitat loss continues to occur, including from cumulative impacts, throughout the species' range due to socio-economic factors beyond the control of the recovery program. The quantification of habitat loss, degradation and protection is not currently possible given such information is not collated as part of existing planning and legislative procedures and the inadequate vegetation mapping currently available.	
2c	Develop a strategy to provide for a continued supply of suitable nest hollows	Current protection focuses on existing hollows rather than future supply. Improvements in the management of hollows for all forest dependent species has been ongoing through the forest practices system; however, the identification of locations of large aggregations of Swift Parrot nests since 2004 have highlighted the need for additional species specific prescriptions to be adopted to ensure an adequate supply of potential nesting hollows in close proximity to potential foraging habitat.	**2**
2d	Ecological thinning in mainland habitats	Early results from Arthur Rylah Institute's (ARI) long-term project examining ecological thinning within Victorian Box-Ironbark forests indicate some changes floristically, however further monitoring is required to reliably detect changes in fauna assemblages. The new plan has no specific action following on from this since the recovery team will generally keep in touch with research relevant to Swift Parrot habitat.	**2**
	Specific Objective 3	**To reduce the incidence of collisions with man-made structures**	
	Recovery Criteria 3	**The incidence of collisions is reduced**	
Action 3	**Reduce the incidence of collisions**	**Comments**	**Score**
3	Reduce the incidence of collisions	Greater public awareness of collision mortality has been achieved within both breeding and wintering areas through the preparation of building guidelines and management recommendations. However, quantifying the incidence/impact of collisions is problematic due to annual variations in the distribution of birds relative to the location of collision threats and the unknown reporting rates of collisions. Therefore this criterion is not measurable given the nature of collision information and lack of baseline data.	**0**
	Specific Objective 4	**To determine population trends within the breeding range**	
	Specific Objective 5	**To quantify improvements in carrying capacity by monitoring changes in extent and quality of habitat**	
	Recovery Criteria 4	**The population density and/or extent and quality of habitat is not reduced and ideally is enhanced**	

Action4	Population and habitat monitoring	Comments	Score
4a	Population monitoring	The Tasmanian population monitoring program in existence at the start of the 2001 recovery plan was terminated after the 2005 breeding season. The program produced valuable data on frequency use by Swift Parrots and flowering, however, in light of new findings on the species' breeding ecology the methodology was assessed to be insufficiently sensitive to reliably monitor population trends. The primary reason for this was an insufficient number of survey sites in known locations and the absence of sites in habitats/regions not previously thought to be suitable for breeding. A new population and habitat monitoring program was initiated in the 2009 breeding season and will be refined over the following two years. The methodology employed for this program takes account of new information on habitat use and annual changes in the relative abundance of Swift Parrots within different regions of the breeding range. Quantification of changes in extent and/or quality of habitat has been problematic due to inadequate mapping of some forest types and habitats and commercial in-confidence issues surrounding access to forest spatial data layers. Furthermore, there is no central digitised repository for recording cumulative habitat loss (or gain) from which this data could be extracted. However, the overall trend in available breeding habitat in Tasmania since 2001 was downwards based on the ongoing clearance and harvesting of foraging and nesting habitat. Prior to 2007 wet forest habitats received little protection whilst production forestry and conversion for plantation development in these areas has intensified. Similarly, foraging habitat in which blue gum occurs as a sub-dominant species was not considered in management prescriptions within the Forest Practices System until more recently.	**2**
4b	Winter surveys	The recovery team has coordinated one of the largest and longest-running community based threatened species surveys in Australia. Unprecedented information on the species' habitat use across south-eastern Australia has been collected with over 11,300 surveys conducted by volunteers as part of the national survey program since 1995. The volunteer network contains over 800 members, over 300 of which are actively involved in the survey program.	**2**
4c	Monitoring the effectiveness of management prescriptions in conserving habitat in production forests.	The effectiveness of management prescriptions in conserving habitat for the Swift Parrot in production forests of Tasmania have been assessed through the standard auditing process, as well as by Munks *et al* (2004). Although specialist prescriptions were generally incorporated in timber harvesting plans, implementation of prescriptions was often not effective in preserving habitat. General Victorian prescriptions have been revised to protect mature habitats for Swift Parrots and are supplemented by special management zones in areas regularly used by this species. Implementation of these prescriptions has recently commenced, however a monitoring program to measure the effectiveness of these prescriptions is yet to be developed. In NSW detailed recommendations for improving prescription measures for Swift Parrot habitat have been provided repeatedly for inclusion during threatened species license reviews. However this information, including published scientific information, has not been accounted for in any prescriptions to date. Limited compliance monitoring of prescriptions is likely to be undertaken as part of a general audit process, however this does not include identifying inadequacies of the prescriptions.	**0**

	Specific Objective 6	**To increase public awareness about the recovery program and to involve the community in recovery**	
	Recovery Criteria 5	**Community based networks are maintained and a newsletter is produced**	
Action5	**Community education and information**	**Comments**	**Score**
5a	Community and volunteer networks	***Tasmania*** In 2009 a volunteer network for breeding season surveys was established. Increased public awareness has been achieved through the production of breeding season survey reports (since 2007), a collision mitigation report, presentations at scientific conferences and training workshops as well as newsletters and news articles in magazines such as Wingspan and Forest Practices News. ***Mainland*** The recovery team has published over 50 documents, including over 25 reports and scientific papers as well as articles in journals, magazines, newspapers and newsletters, several TV appearances. There have been over 45 radio interviews and 35 volunteer training workshops in regional areas of Victoria and NSW, promoting the recovery effort and fostering public interest, involvement and conservation. Hundreds of audio recordings of Swift Parrot calls have been distributed to volunteers, community members and natural history/bird groups for education purposes and to enable training in call recognition. Two educational videos have also been developed and distributed both on DVD and YouTube. Recovery program updates were provided to the volunteer network twice a year prior to each of the national volunteer survey weekends. These updates provide the latest information from the volunteer surveys as well as providing support and encouragement for continued community involvement in the program.	**3**
5b	Newsletter	The annual recovery program newsletter "Swifts Across the Strait" was distributed to all volunteers and other stakeholders from 1995-2007. This newsletter is no longer produced due to the cessation of funding, however Swift Parrot information will be incorporated into the regent honeyeater recovery program newsletter in 2010.	**3**
Action6	**Manage the recovery process through a recovery team**	**Comments**	**Score**
6	Manage the recovery process through a recovery team	From 1995 to 2008 bi-annual recovery team meetings were held at various locations throughout the range of the Swift Parrot. This ensured all team representatives contributed to addressing relevant actions for each of the above recovery criteria. In 2009 the recovery team met only once due to funding and timing constraints however bi-annual meetings will again be held in 2010.	**3**

Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from:
http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

This report should be attributed as '*National Recovery Plan for the Swift Parrot (Lathamus discolor)*, Commonwealth of Australia 2020'.

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Maintain ~~Protect~~ known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team should ~~includes~~include ~~individuals~~ representatives from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014).

Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review ~~iew~~ concluded that despite increases in knowledge across a range of domains and progress implementing many of the actions, the Plan's overall objective has not been achieved and "*that there were ongoing declines in the number of mature individuals, and in the area and quality of habitat available for the species, including clearing of breeding habitat*". Of 28 specific actions in the plan, at the time of the review: seven were considered not to have commenced or had otherwise made only minimal progress; some progress had been made for 14 actions; and seven were identified as completed and/or ongoing (REF) ~~(ref), the previous plan resulted in:~~

~~- Increased understanding of the habitat features associated with breeding;~~

~~- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across mainland jurisdictions on Swift Parrot habitat management; and~~

~~- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.~~

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

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Varying levels of progress, from not commenced to completed and ongoing, are identified in this review.

This highlights a key overall concern relating to this draft document, i.e. a consistent narrative focus on real or perceived inadequacies in Tasmania's forestry management.
The imbalance in narrative around threats presents challenges for Tasmania to endorse this document.

Tasmania acknowledges, and is committed to, the need for ongoing refinement and improvement in that space.

However, there is scope for improvement in:
1) knowledge,
2) application of management mechanisms (regulatory or voluntary) and
3) compliance/uptake
for all threats, including mainland forestry activities, non forestry-related habitat loss, firewood collection, collision and other development impacts, climate change etc.

It is recommended that throughout the document, the level of detail afforded to Tasmanian forest management be reduced so that it is consistent with the treatment of all threats.

Accordingly, suggested wording is provided in track changes. Happy to work with you to finesse.

If the determination is to retain that level of detail around forest management in Tasmania, then each threat needs to subject to a similar level of commentary and critique – in both mainland and Tasmanian contexts.

This will make for quite a large document.

If that is the preference, then note there are several inaccuracies or otherwise contested statements in the narrative around Tasmanian forestry as written that would need to be addressed.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in knowledge and scientific evidence (Webb et al. 2019). The Swift Parrot is Critically Endangered, and therefore urgent action is needed to save the species from extinction. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, such as the Public Authority Management Agreement covering the Southern Forests in Tasmania, there remain many unresolved challenges for habitat protection. For example, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues despite extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of forestry operations (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east regions of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low, probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, the Action Plan for Australian Birds suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011), but has declined since and was estimated to be 750 (range 300-1000) mature individuals in 2020 (Webb et al. 2021). A preliminary study ~~Based on~~ using genetic data has estimated the ~~, the~~ effective population size (N_e) of the Swift Parrot to be between ~~is~~ 60–338 individuals (Olah et al. 2020) noting that N_e is a parameter commonly used in population genetics to quantify loss of genetic variation in populations and it is often smaller than the census population size (N_c) (e.g. Kilman et al 2008). ~~.~~

While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011).

While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

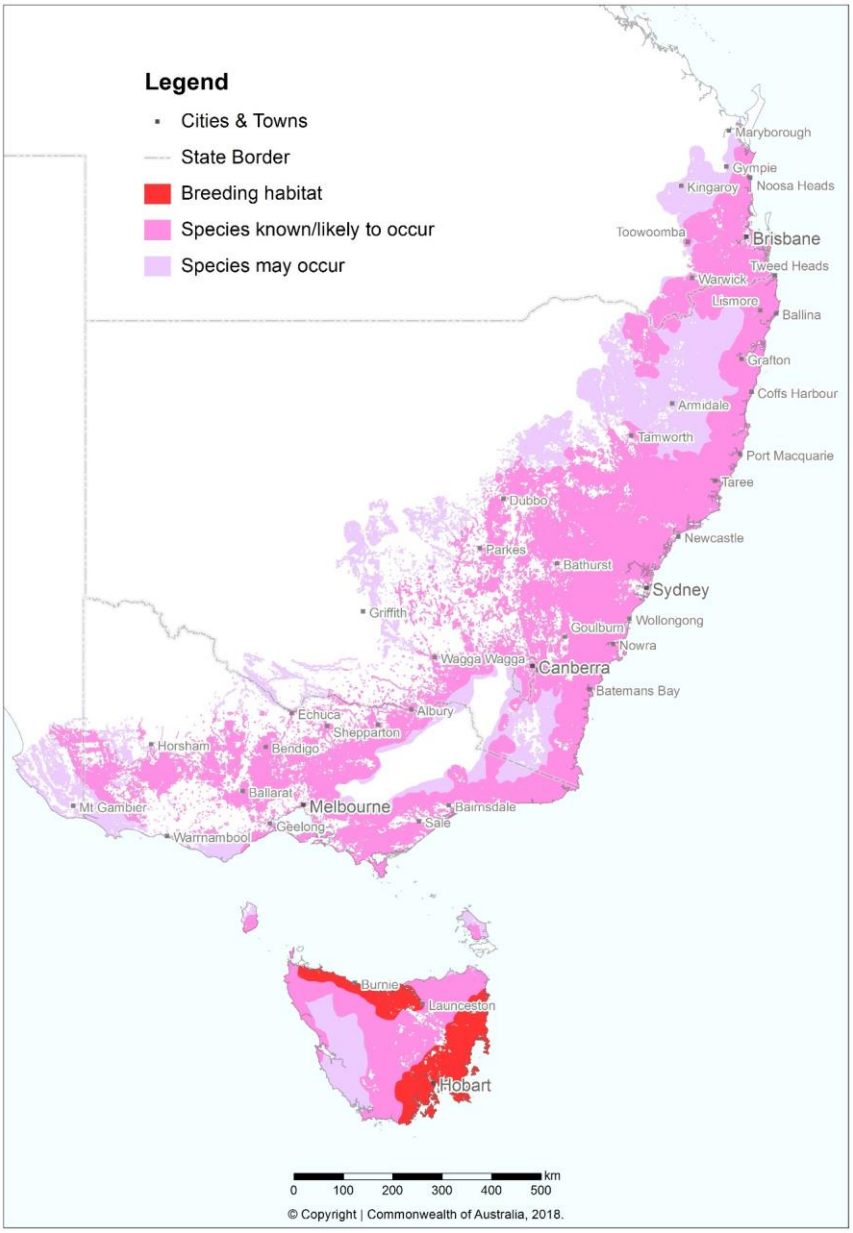

Figure 1 – Indicative distribution of the Swift Parrot in Australia

Commented [A2]: As per Tas Gov submission (2019), using the finer scale range boundaries layer provided by Tasmania would greatly assist in alleviating potential confusion and in developing an accurate and clear definition of critical breeding habitat. It is DPIPWE's preference that the layer is used. i.e. currently, areas are missing on the west coast for example.

If there is no scope to amend this map, then please amend legend from "breeding habitat" to 'potential breeding range' and ensure it retains "indicative" in the Figure Legend, with a clear reference to finer scale evidence based management boundaries defining "potential breeding range" developed by DPIPWE as the definitive source. (reference can be supplied)

It will be important to retain "indicative" in either case as this map and Tasmania's finer scale layers are subject change, either with new knowledge.

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Other foraging species may be important at certain times of the year. Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (BirdLife Australia pers. comm.).

Commented [A3]: Is it appropriate to pers. comm an organisation?

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005).

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 1). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). The flowering patterns of other potential forage eucalypt species, including Brooker's Gum (*E. brookeriana*), may also be important determinants of Swift Parrot breeding distribution.

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least

140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). From one season to the next, Blue Gum or Black Gum may comprise the primary foraging resource. ~~Similarly, p~~Planted Blue Gums (e.g. street and plantation trees) ~~in north-west Tasmania~~ may provide a temporary local food resource in some years, noting that plantation Blue Gum are unlikely to provide substantial forage resources due to age, tree density and genetic strain (FPA 2011). ~~In the north-west, Black Gum forest may represent the primary foraging resource. Similarly, in years with little Blue Gum flowering, Black Gum can comprise the primary foraging resource.~~

Commented [A4]: Not clear why this NW is singled out specifically here where the SE is not. Made some suggestions for clarity.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8

eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This is a non-statutory ~~is~~ process ~~is~~ guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However, existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management

in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.
- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.
- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.
- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and

Commented [A5]: There are effectively four pages in the draft plan dedicated to KBA's which:

a) suggests there is some statutory or management weight to them and
b) makes for some challenging reading

Tasmania suggests dramatically cutting the explanatory content and just referring to the website.

Perhaps paragraph 2 and 3 could go entirely.

The list of KBA's themselves could go into a table (perhaps in an appendix)?

Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda,

Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot in a given year, subject to seasonal flowering conditions.

- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of ~~Swift Parrots and~~ Endangered Forty-spotted Pardalotes, and, subject to seasonal flowering conditions, a significant number of Swift Parrots.

- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula. ~~The area has been identified as a KBA because it contains almost all the breeding habitat of the Swift Parrot on the Tasmanian mainland.~~

Commented [A6]: Deleted as this is not consistent with Figure 1.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or

- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The migratory nature of the species means that they require a large network of resources both during and between annual cycles. Actions that directly and/or indirectly affect the species or their habitats could compromise recovery.

Noting the requirements of the species, habitat critical to the survival for the Swift Parrot includes:

Breeding habitat in Tasmania

~~All native forest and woodland containing Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species within the known breeding areas. Known breeding areas are areas containing known nest records and areas deemed as important for breeding by species specialists or the Recovery Team.~~

In different years the majority of the breeding population may be concentrated within a subset of the potential breeding range, according to spatially and temporally variable flowering patterns of preferred foraging species.

Therefore, within areas where breeding is most likely to occur based on known breeding records, scientific literature and expert opinion, habitat critical to survival of swift parrots comprises both *potential foraging habitat* – which is native forest and woodland containing either Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species, and *potential nesting habitat* – which is forests or woodlands containing hollow-bearing eucalypt trees within foraging range (~10km) of potential foraging habitat that is old enough to flower

- ~~All known nest trees, as well as forest and woodland containing potential nesting trees within the known breeding areas. Potential nesting trees typically contain hollows, have a large trunk diameter at breast height, and have signs of senescence (i.e. contain dead wood).~~

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*) having a diameter at breast height of 60 cm or greater.

Commented [A7]: There are challenges with this description – particularly the component "as deemed important by specialists or the recovery team" and the lack of explicit defined characteristics.

Suggested wording for discussion and consideration, but see also point below.

Commented [A8]: If the suggested map adjustments are made – this could be further simplified to:

habitat critical to survival of swift parrots comprises both *potential foraging habitat* – which is native forest and woodland containing either Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species, and *potential nesting habitat* – which is forests or woodlands containing hollow-bearing eucalypt trees within foraging range (~10km) of potential foraging habitat that is old enough to flower, within the potential breeding range.

~~*Habitat for the long-term maintenance of the species*~~

- ~~Suitable habitat within all Key Biodiversity Areas with Swift Parrot as a Trigger species~~.

Key considerations in assessing environmental impacts

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. It is essential that protection is provided to these areas and that enhancement and restoration measures target these productive sites.

Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed. Actions that have indirect impacts on habitat critical to the survival should be minimised (i.e. noise and light pollution). Actions that compromise adult and juvenile survival should also be avoided, such as the introduction of new diseases, weeds or predators.

Actions that remove habitat critical to the survival would interfere with the recovery of Swift Parrots and reduce the area of occupancy of the species. In Tasmania, it is important to retain a mosaic of breeding habitat (i.e. nesting and foraging areas), particularly on Bruny and Maria Islands where Sugar Gliders are not present. Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time. If removal of habitat critical to the survival cannot be avoided or mitigated then an offset must be identified and secured prior to clearing, consistent with the EPBC Act Environmental Offsets Policy. Suitable offsets may include:

- Inclusion of unprotected areas of habitat critical to the survival in permanent nature reserves and provision of funding for the management of these areas.
- Restoration of native forest and woodlands adjacent to habitat critical to the survival to reduce edge effects.
- The control of Sugar Gliders in and adjacent to habitat critical to the survival in Tasmania.
- Actions that will help address knowledge gaps identified in this recovery plan.

When considering habitat loss, alteration or significant impacts to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a given location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

Commented [A9]: There are several concerns about putting KBA's under "critical habitat section"

Habitat critical to the survival carries statutory weight under EPBC – albeit with limitations. KBA's do not.

However, that is a nuance that will not be picked up by majority of readers of this plan. It has potential to create confusion.

It is also explicitly noted that KBA's can change at any time subject to new information and application of criteria.

Given that suitable habitat within the KBA's will already be captured by the breeding and foraging habitat descriptions above, AND the latter descriptions will cover habitat outside of KBA's – their inclusion here creates potential confusion and the request is that it be removed from this section.

This sentence could easily be relocated/or captured in the dedicated KBA section. "The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species"

Formatted: No bullets or numbering

Commented [A10]: Tasmania noted issues with current draft wording relating to use of "must" etc, but understand this section has been subsequently updated by DAWE compliance area, so have not gone into specifics.

THREATS

3.1 Historical causes of decline

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003). ; and In Tasmania there has also been significant historical loss and alteration of habitat within the primary breeding and foraging range, along the south-east coast. This has included the loss of , approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011), and over 90 percent of Black Gum forest (Department of Environment and Energy 2018) has been cleared.

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the predation of nestlings and incubating females by the introduced Sugar Glider, ongoing loss or degradation of f breeding and foraging habitat through a range of processes including, forestry operations, land clearing and wildfire. The main threats on the Australian mainland include habitat loss from land clearing for agriculture and urban development, and to a lesser extent forest harvesting. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change.

3.2.1 Habitat loss and alteration

Forestry and land clearing

MSince uch of the Swift Parrot potential breeding habitat in Tasmania is outside the is poorly reserved in the National Reserve Network in TasmaniL a, , there is considerable reliance on the protection measures delivered through the Tasmanian forest practices system.

Habitat Lloss of potential breeding habitat in in Tasmania via through land cclearanceing for conversion to agriculture, native forest logging and intensive native forest silviculture practices poses the greatest threat to survival of the Swift Parrot population (Webb et al. 2017; Webb et al. 2019). Forestry operations and conversion of native forest to tree plantations over the past 30 years has continues to reduced the amount of available Swift Parrot nesting and foraging habitat and it therefore remains a significant threat to the continued persistence of the species (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017, Webb et al. 2019).

There are no comprehensive estimates assessing loss of potential breeding habitat through forest harvesting or land clearing in recent years across the species breeding range. However one For example, one case study using the Southern Forests Swift Parrot Important Breeding Area (SPIBA) (one of 12 key breeding regions delineated for management purposes, Forest Practices Authority, 2010) Recent estimated that forest harvesting between 1997 and 2016 estimates of forest harvesting in the Southern Forests Swift Parrot Important Breeding Areahad resulted in as much as

Commented [A11]: Can DAWE confirm this 90% of Black Gum forest relates to communities?

Commented [A12]: Following on from the comment on P7: this is an unbalanced presentation, with extensive detailed focus on Tasmanian native forest management compared to other threats (including foresty and land clearance on the mainland).

Specific concerns were raised in this regard in the Tasmanian Government submission in 2019 and do not appear to have been fully addressed.

Additional issues identified are as follows:

There is substantial information about the RFA provided, however the RFA is only relevant for the specific forestry aspects. Suggest simply referring to the Tasmanian Forest Management System, which is the accredited legislative and policy system under the RFA, but which also applies to other activities in its own right, i.e. clearance and conversion for agricultural purposes.

This section does not touch on smaller scale land clearing for other purposes – which is not managed through the forest management system – for example clearance for easements, residential and industrial developments.

It is the only threat section discussed in great detail and most of the commentary provided identifies (real or contested) failings in the forest practices system. If retained, then additional context, corrections or alternative positions will need to be included.

Presumably, based on how other threats are treated, the purpose of this section is to detail the threats, not critique relevant legislative and policy management practices, e.g. there is no equivalent discussion around regulatory approaches for illegal firewood.

A discussion may be needed to resolve this issue, however some suggested wording is provided.

Commented [A13]: Suggest this be removed as unnecessary detail not provided elsewhere. It can easily be researched if the reader seeks to understand more about the Tasmanian Forest Management System.

The RFA provides an alternative mechanism for delivery of the requirements for threatened species protection and recovery under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act. RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, and is intended to provide a stream-lined management process for threatened species in the context of wood production (FPA 2014).

Commented [A14]: Suggest this be removed *"As nesting hollows generally only occur in old trees and larger trees have proportionally more nectar and food resources, the harvesting of breeding and foraging habitat in native forests remains the most significant threat to the species' persistence in the wild".*

It seems repetitive and relevance not entirely clear - or at least this may more appropriately fit in a general paragraph above as it pertains to all forms of habitat loss.

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in Tasmania shows that between 1997 and 2016, approximately 33 percent of all native eucalypt forest was converted to plantation or harvested, and 23 percent of the identified potential nesting habitat (i.e. old growth trees) which contained critical nest hollow resources for the speciesbeing , was lost in this time, noting that prior to 2007, this region was not recognised as supporting swift parrot breeding (Webb et al. 2019). There are no similar estimates available across other parts of the species breeding range. .

Much of the Swift Parrot potential breeding habitat in Tasmania is on private and public land that is Recent estimates of forest harvesting in the Southern Forests Swift Parrot Important Breeding Area in Tasmania shows that between 1997 and 2016, approximately 33 percent of all native eucalypt forest was converted to plantation or harvested, and 23 percent of the identified nesting habitat (i.e. old growth trees) which contained critical nest hollow resources for the species, was lost (Webb et al. 2019). As nesting hollows generally only occur in old trees and larger trees have proportionally more nectar and food resources, the harvesting of breeding and foraging habitat in native forests remains the most significant threat to the species' persistence in the wild.

A significant area of the Swift Parrot breeding habitat is subject to management arrangements under the under the Tasmanian Regional Forest Agreement 1997 (RFA) and the underpinning Tasmanian Forest Management System (https://www.stategrowth.tas.gov.au/__data/assets/pdf_file/0018/154620/5_Overview_Tasmania_Forest_Management_System_2017.pdf to protect swift parrot potential breeding habitat.

. The RFA provides an alternative mechanism for delivery of the requirements for threatened species protection and recovery under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act.

RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the *Tasmanian Forest Practices Act 1986*, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, and is intended to provide a stream-lined management process for threatened species in the context of wood production (FPA 2014). https://www.fpa.tas.gov.au/__data/assets/pdf_file/0020/132455/Forest_Practices_Code_2020_for_printing_10591_KB.PDF).

The process of adaptive management and continuous improvement is built into the Tasmanian Forest Management System, and specific

Mmanagement arrangements for Swift Parrots have continued to evolved since 1996 to account for new knowledge and initially only applied to dry forest habitat (e.g. Forest Practices Authority 2010; Munks et al. 2004). and which were erroneously considered a priority for the species, based on information existing at the time. In 2007 it was recognised that wet forests are just as crucial component of the breeding habitat for Swift Parrots (Webb 2008; Webb et al. 2014, 2017, 2019). Tthe current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through the 'Agreed Procedures' and a decision support system, the Threatened Fauna Adviser (Forest Practices Authority 2014). However there remains an ongoing need for continual monitoring, evaluation and adaptive

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improvement in management approaches, particularly with regards to measures addressing habitat recruitment, ~~and~~ the refinement

~~The Tasmanian Forest Practices System has not protected all of the breeding habitat for the species, increasing the threats to the species (Webb et al 2019).~~

~~Since Swift Parrot breeding habitat is poorly reserved in the National Reserve Network in Tasmania, there is considerable reliance on the protection measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information~~of knowledge including ~~and incorporat~~in regards to ~~ion of on~~ nesting and foraging habitat requirements and their spatial and temporal ~~avai~~availability~~lability and management approaches. in off-reserve areas is urgently required to refine and ensure the effectiveness of these measures.~~

~~Currently, there are no measures addressing habitat recruitment.~~

~~The Tasmanian Forest Practices System has not protected all of the breeding habitat for the species, increasing the threats to the species (Webb et al 2019).~~

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The loss of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban and agricultural land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

Recent fires in (YEAR?) Tasmania have destroyed and/or negatively impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

Commented [A15]: This threat could usefully be combined into the "forestry and land clearing" often just on smaller scales and subject to different management arrangements – e.g. clearance for mining, easements, residential expansion, approved developments – all cumulatively account for habitat loss.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species~~, which interacts synergistically with deforestation~~ (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and the likelihood of Sugar Glider predation decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). The Tasmanian Government subsequently amended Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 to remove Sugar Gliders in 2018. Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows. An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from a range of native and non-native species, including the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data)~~., or impacted by climate change.~~

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to

understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single threat increases the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. ~~Protect~~ Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.

Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Identify known breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
1.2	Secure Tasmanian and Commonwealth Government commitment to support strategic planning for Swift Parrot breeding habitat	1	• The Public Authority Management Agreement (PAMA, under the TSPAct 1995) between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests is being implemented and monitored • Annual monitoring has occurred and an ongoing review of the implementation and effectiveness of the current management	**Australian Government** **Tasmanian Government** **Sustainable Timbers Tasmania** **Local Councils** Private landholders	Core government business

Commented [A16]: The performance criteria suggest this to be solely around forest harvest management in Tasmania, yet this is not clear from the action title.

In addition, note:
a PAMA has been developed and signed.

Tasmania would prefer to develop and implement an action plan that is landscape-wide, across tenures, activities and regulatory contexts, including forest harvesting activities, but not limited to.

Clarification is sought:
around the intent and scope of the strategic management plan performance measure
the Commonwealth's role in securing this strategic plan

It is also not clear to what extent the specific concerns raised in the TasGov 2019 submission have been addressed.

This action may need a targeted conversation to resolve.

			recommendations has been undertaken • Recommendations from the ongoing review have been considered and implemented • An agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population between 2021-2031 has been completed and implemented		
1.3	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business
1.4	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset	**Australian Government** **State governments** **Local government**	Core government business

			regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan		
1.5	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa
1.6	Reducegulate firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat • Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** **Private landholders**	$75,000 pa
1.7	Develop agreements with local government and government agencies that aim to maintain and enhance Swift Parrot breeding habitat	2	• Management agreements have been developed with local government and state government agencies which maintain and enhance Swift Parrot breeding habitat	**State governments** **Local government**	$150,000 pa

Commented [A17]: This action should not rely on regulatory approaches.

Commented [A18]: Is this and agreement BETWEEN local government and government agencies?

Noting that in the Tasmanian context, with the large number of local councils (29), although admittedly not all will be relevant, this is not necessarily a practical objective.

Tasmania would likely seek to achieve the intent of this through the single landscape-wide strategic approach to breeding habitat – i.e. including all drivers of regulatable habitat loss.

			• Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat	**NRM regional bodies** Private landholders	
1.8	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
1.9	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified • Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	**Australian Government** **State governments** **Local government** **NRM regional bodies** Private landholders BirdLife Australia NGOs	$150,000 pa

1.10	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 2**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
2.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped • A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa

2.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
2.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000 pa
2.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions • An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000
2.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success	**Tasmanian Government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• New knowledge has been incorporated into management interventions	NGOs Academic institutions	
2.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
2.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to Maria and Bruny Islands	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response protocols to eliminate Sugar Gliders on Maria and Bruny Islands	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$75,000 pa
2.8	Continue regulatory reform of Sugar Glider protected wildlife status	1	• The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core government business

***Strategy 3**: Monitor and manage other sources of mortality*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
3.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000
3.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders**	$50,000

				BirdLife Australia NGOs	
3.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
3.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

Strategy 4*: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
4.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa

4.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
4.4	Maintain a free and openly available database for population, habitat and distributional data	2	• A free and openly available central repository for reporting monitoring observations has been identified • Relevant government databases have been maintained and updated on a regular basis • Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$50,000 pa
4.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to	**Recovery Team** **State governments**	$75,000

			inform management actions and priorities	**Research agencies** NGOs Academic institutions BirdLife Australia	
4.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

***Strategy 5**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management • Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
5.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns,	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa

			patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions		
5.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$140,000 pa
5.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

***Strategy 7**: Coordinate, review and report on recovery progress*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 2	$555,000	$475,000	$475,000	$475,000	$475,000	$2,455,000
Strategy 3	$125,000	$50,000	$50,000	$50,000	$50,000	$325,000
Strategy 4	$340,000	$275,000	$275,000	$200,000	$275,000	$1,365,000
Strategy 5	$415,000	$415,000	$665,000	$415,000	$415,000	$2,325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$30,000	$60,000	$30,000	$40,000	$190,000
TOTAL	$2,935,000	$2,715,000	$2,995,000	$2,640,000	$2,725,000	$14,010,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from:
http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team should include representatives from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014).

Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that despite increases in knowledge across a range of domains and progress implementing many of the actions, the Plan's overall objective has not been achieved and "*that there were ongoing declines in the number of mature individuals, and in the area and quality of habitat available for the species, including clearing of breeding habitat*". Of 28 specific actions in the plan, at the time of the review: seven were considered not to have commenced or had otherwise made only minimal progress; some progress had been made for 14 actions; and seven were identified as completed and/or ongoing.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in

knowledge and scientific evidence (Webb et al. 2019). The Swift Parrot is Critically Endangered, and therefore urgent action is needed to save the species from extinction. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, such as the Public Authority Management Agreement covering the Southern Forests in Tasmania, there remain many unresolved challenges for habitat protection. For example, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues despite extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of forestry operations (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of *pip-pip-pip* (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east

regions of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low, probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, the Action Plan for Australian Birds suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011), but has declined since and was estimated to be 750 (range 300-1,000) mature individuals in 2020 (Webb et al. 2021). A preliminary study using genetic data has estimated the effective population size (N_e) of the Swift Parrot to be between 60–338 individuals (Olah et al. 2020) noting that N_e is a parameter commonly used in population genetics to quantify loss of genetic variation in populations and it is often smaller than the census population size (N_c) (e.g. Wang ~~Kilman~~ et al. 2016~~08~~).

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While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in

numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011).

While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

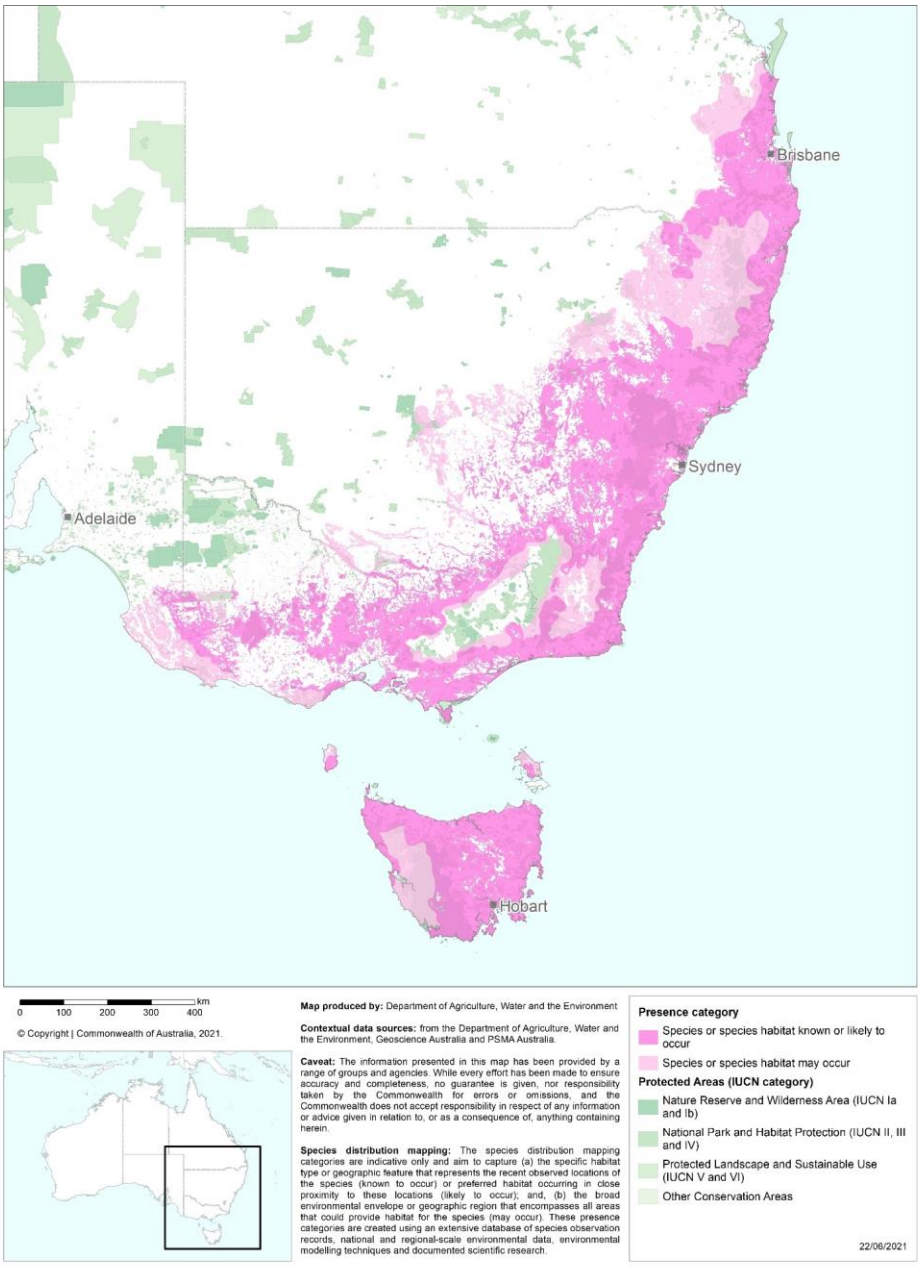

Figure 1 – Indicative distribution of the Swift Parrot in Australia

Figure 2 – Potential breeding range of Swift Parrot in Tasmania

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Other foraging species may be important at certain times of the year. Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (S. Vine BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005).

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 2). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). The flowering patterns of other potential forage eucalypt species, including Brooker's Gum (*E. brookeriana*), may also be important determinants of Swift Parrot breeding distribution.

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

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Swift Parrot Important Breeding Area (SPIBA) are known or suspected to have supported a large portion of the Swift Parrot breeding population in any given year.[1]

The core range of the swift parrot is the area within the SE potential breeding range that is within 10km of the coast or is designated as a SPIBA (as defined in FPA 2010)[2]

The potential breeding range of the swift parrot comprises the NW potential breeding range and the SE potential breeding range. The NW potential breeding range includes the NW breeding areas (known nesting locations e.g. Gog Range, Badger Range, Kelcey Tier). [2]

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references

[1]Forest Practices Authority (FPA) (2010). Interim Species Habitat Planning Guideline for the Conservation Management of Lathamus discolor (Swift Parrot) in Areas Regulated under the Tasmanian Forest Practices System. Internal report to the Forest Practices Authority, Hobart, Tasmania.

[2] 'Threatened fauna species range boundaries and habitat descriptions' V1.12 May 2021 at https://www.fpa.tas.gov.au/__data/assets/pdf_file/0011/111404/Threatened_fauna_range_and_habitat_descriptions_Table_Nov_19.pdf (definitions agreed between FPA/DPIPWE).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). From one season to the next, Blue Gum or Black Gum may comprise the primary foraging resource. Planted Blue Gums (e.g. street and plantation trees) may provide a temporary local food resource in some years, noting that plantation Blue Gum are unlikely to provide substantial forage resources due to age, tree density and genetic strain (FPA 2014~~1~~).

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Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8 eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This is a non-statutory process guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However,

existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.

- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.

- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.

- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods

which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of

woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot in a given year, subject to seasonal flowering conditions.
- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Endangered Forty-spotted Pardalotes, and, subject to seasonal flowering conditions, a significant number of Swift Parrots.
- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The migratory nature of the species means that they require a large network of resources both during and between annual cycles. Actions that directly and/or indirectly affect the species or their habitats could compromise recovery.

Noting the requirements of the species, habitat critical to the survival for the Swift Parrot includes:

Breeding and foraging habitat in Tasmania

- In different years the majority of the breeding population may be concentrated within a subset of the potential breeding range, according to spatially and temporally variable flowering patterns of preferred foraging species.
- Therefore, within areas where breeding is most likely to occur based on known breeding records, scientific literature and expert opinion, habitat critical to survival of Swift Parrots comprises both *potential foraging habitat* – which is native forest and woodland containing either Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species, and *potential nesting habitat* – which is forests or woodlands containing hollow-bearing eucalypt trees within foraging range (~10km) of potential foraging habitat that is old enough to flower.

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*).

Key considerations in assessing environmental impacts

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. It is essential that protection is provided to these areas and that enhancement and restoration measures target these productive sites.

Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed. Actions that have indirect impacts on habitat critical to the survival should be minimised (i.e. noise and light pollution). Actions that compromise adult and juvenile survival should also be avoided, such as the introduction of new diseases, weeds or predators.

Actions that remove habitat critical to the survival would interfere with the recovery of Swift Parrots and reduce the area of occupancy of the species. In Tasmania, it is important to retain a mosaic of breeding habitat (i.e. nesting and foraging areas), particularly on Bruny and Maria Islands where Sugar Gliders are not present. Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time. If removal of habitat critical to the survival cannot be avoided or mitigated then an offset should be provided. ~~must be identified and secured prior to clearing, consistent with the EPBC Act Environmental Offsets Policy.~~ Suitable offsets may include:

- Inclusion of unprotected areas of habitat critical to the survival in permanent nature reserves and provision of funding for the management of these areas.
- Restoration of native forest and woodlands adjacent to habitat critical to the survival to reduce edge effects.
- The control of Sugar Gliders in and adjacent to habitat critical to the survival in Tasmania.
- Actions that will help address knowledge gaps identified in this recovery plan.

Surveys

When considering habitat loss, alteration or ~~significant impacts~~ degradation to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots.

In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a given location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

THREATS

3.1 Historical causes of decline

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and

70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003). In Tasmania there has also been significant historical loss and alteration of habitat within the primary breeding and foraging range, along the south-east coast. This has included the loss of approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011) and over 90 percent of Black Gum – Brookers Gum forest (Department of Environment and Energy 2018).

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the predation of nestlings and incubating females by the introduced Sugar Glider, ongoing loss or degradation of breeding and foraging habitat through a range of processes including, forestry operations, land clearing and wildfire. The main threats on the Australian mainland include habitat loss from land clearing for agriculture and urban development, and to a lesser extent forest harvesting. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change.

3.2.1 Habitat loss and alteration

Forestry and land clearing

Loss of potential breeding habitat in Tasmania via clearance for conversion to agriculture, native forest logging and intensive native forest silviculture practices continues to reduce the amount of available Swift Parrot nesting and foraging habitat and it therefore remains a significant threat to the continued persistence of the species (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017, Webb et al. 2019).

There are no comprehensive estimates assessing loss of potential breeding habitat through forest harvesting or land clearing in recent years across the species breeding range. However one case study using the Southern Forests Swift Parrot Important Breeding Area (SPIBA) (one of 12 key breeding regions delineated for management purposes, Forest Practices Authority, 2010) estimated that forest harvesting between 1997 and 2016 had resulted in as much as 23 percent of identified potential nesting habitat being lost in this time, noting that prior to 2007, this region was not recognised as supporting swift parrot breeding (Webb et al. 2019).

Much of the Swift Parrot potential breeding habitat in Tasmania is on private and public land that is subject to management arrangements under the Tasmanian Forest Management System (https://www.stategrowth.tas.gov.au/__data/assets/pdf_file/0018/154620/5_Overview_Tasmania_Forest_Management_System_2017.pdf.

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The process of adaptive management and continuous improvement is built into the Tasmanian Forest Management System, and specific management arrangements for Swift Parrots have continued to evolve since 1996 to account for new knowledge (e.g. Forest Practices Authority 2010; Munks et al. 2004). However there remains an ongoing need for continual monitoring, evaluation and adaptive improvement in management approaches, particularly with regards to measures addressing habitat recruitment, the refinement of knowledge including in regards to nesting and foraging habitat requirements and their spatial and temporal availability.

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The loss of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban and agricultural land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term

study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

In 2013 and 2019, fires in Tasmania impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that survival of Swift

Parrot nests was a function of modelled mature forest cover in the surrounding landscape and the likelihood of Sugar Glider predation decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). The Tasmanian Government subsequently amended Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 to remove Sugar Gliders in 2018. Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows. An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from a range of native and non-native species, including the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al.

1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data).

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single

threat increases the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
1.1	Identify breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
1.2	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business

1.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan	**Australian Government** **State governments** **Local government**	Core government business
1.4	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

1.5	Reduce firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat • Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** **Private landholders**	$75,000 pa
1.6	Develop agreements between local government and government agencies that aim to maintain and enhance Swift Parrot habitat	2	• Management agreements have been developed between local government and state government agencies which maintain and enhance Swift Parrot habitat • Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** Private landholders	$150,000 pa
1.7	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
1.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified	**Australian Government** **State governments** **Local government**	$150,000 pa

			• Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	**NRM regional bodies** Private landholders BirdLife Australia NGOs	
1.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 2**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
2.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped	**Tasmanian Government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	NGOs Academic institutions	
2.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
2.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000 pa
2.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions	**Tasmanian Government** **NRM regional bodies**	$50,000

			• An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Research agencies** NGOs Academic institutions	
2.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
2.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
2.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to Maria and Bruny Islands	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$75,000 pa

			protocols to eliminate Sugar Gliders on Maria and Bruny Islands		
2.8	Continue regulatory reform of Sugar Glider protected wildlife status	1	• The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core government business

***Strategy 3**: Monitor and manage other sources of mortality*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
3.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000

3.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
3.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

Strategy 4*: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action	**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**

4.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa
4.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
4.4	Maintain a free and openly available database for population, habitat and distributional data	2	• A free and openly available central repository for reporting monitoring observations has been identified • Relevant government databases have been maintained and updated on a regular basis	**Recovery Team** **State governments** **Research agencies** NGOs	$50,000 pa

			• Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	Academic institutions BirdLife Australia	
4.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to inform management actions and priorities	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

***Strategy 5**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management • Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
5.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns,	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa

			patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions		
5.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$140,000 pa
5.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

***Strategy 7**: Coordinate, review and report on recovery progress*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 2	$555,000	$475,000	$475,000	$475,000	$475,000	$2,455,000
Strategy 3	$125,000	$50,000	$50,000	$50,000	$50,000	$325,000
Strategy 4	$340,000	$275,000	$275,000	$200,000	$275,000	$1,365,000
Strategy 5	$415,000	$415,000	$665,000	$415,000	$415,000	$2,325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$30,000	$60,000	$30,000	$40,000	$190,000
TOTAL	$2,935,000	$2,715,000	$2,995,000	$2,640,000	$2,725,000	$14,010,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

This report should be attributed as '*National Recovery Plan for the Swift Parrot (Lathamus discolor)*, Commonwealth of Australia 2020'.

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team includes individuals from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014). Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across mainland jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in knowledge and scientific evidence (Webb et al. 2019). The Swift Parrot is Critically Endangered, and therefore urgent action is needed to save the species from extinction. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, such as the Public Authority Management Agreement covering the Southern Forests in Tasmania, there remain many unresolved challenges for habitat protection. For example, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues despite extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of forestry operations (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east regions of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low, probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, the Action Plan for Australian Birds suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011), but has declined since and was estimated to be 750 (range 300-1000) mature individuals in 2020 (Webb et al. 2021). Based on genetic data, the effective population size (N_e) is 60–338 individuals (Olah et al. 2020).

While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in

numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

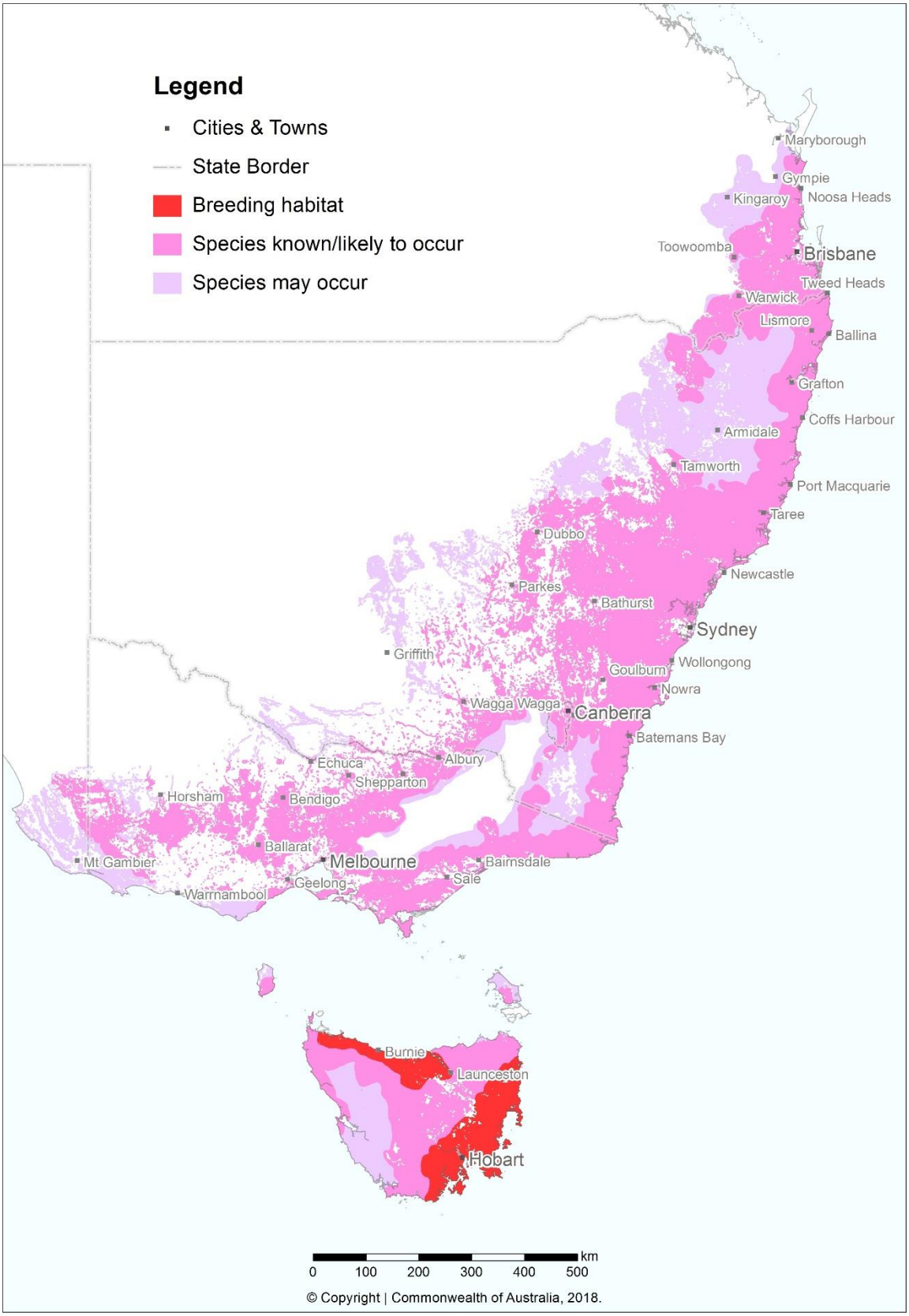

Figure 1 – Indicative distribution of the Swift Parrot in Australia

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Other foraging species may be important at certain times of the year. Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005).

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 1). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). The flowering patterns of other potential forage eucalypt species, including Brooker's Gum (*E. brookeriana*), may also be important determinants of Swift Parrot breeding distribution.

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least

140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide a temporary local food resource in some years. In the north-west, Black Gum forest may represent the primary foraging resource. Similarly, in years with little Blue Gum flowering, Black Gum can comprise the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8 eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the

female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This process is guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However, existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many

KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.

- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.

- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.

- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State

Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark

Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot.
- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Swift Parrots and Endangered Forty-spotted Pardalotes.
- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula. The area has been identified as a KBA because it contains almost all the breeding habitat of the Swift Parrot on the Tasmanian mainland.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The migratory nature of the species means that they require a large network of resources both during and between annual cycles. Actions that directly and/or indirectly affect the species or their habitats could compromise recovery.

Noting the requirements of the species, habitat critical to the survival for the Swift Parrot includes:

Breeding habitat in Tasmania

- All native forest and woodland containing Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species within the known breeding areas. Known breeding areas are areas containing known nest records and areas deemed as important for breeding by species specialists or the Recovery Team.
- All known nest trees, as well as forest and woodland containing potential nesting trees within the known breeding areas. Potential nesting trees typically contain hollows, have a large trunk diameter at breast height, and have signs of senescence (i.e. contain dead wood).

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*) having a diameter at breast height of 60 cm or greater.

Habitat for the long-term maintenance of the species

- Suitable habitat within all Key Biodiversity Areas with Swift Parrot as a Trigger species.

Key considerations in assessing environmental impacts

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. It is essential that protection is provided to these areas and that enhancement and restoration measures target these productive sites.

Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed. Actions that have indirect impacts on habitat critical to the survival should be minimised (i.e. noise and light pollution). Actions that compromise adult and juvenile survival should also be avoided, such as the introduction of new diseases, weeds or predators.

Actions that remove habitat critical to the survival would interfere with the recovery of Swift Parrots and reduce the area of occupancy of the species. In Tasmania, it is important to retain a mosaic of breeding habitat (i.e. nesting and foraging areas), particularly on Bruny and Maria Islands where

Sugar Gliders are not present. Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time. If removal of habitat critical to the survival cannot be avoided or mitigated then an offset must be identified and secured prior to clearing, consistent with the EPBC Act Environmental Offsets Policy. Suitable offsets may include:

- Inclusion of unprotected areas of habitat critical to the survival in permanent nature reserves and provision of funding for the management of these areas.
- Restoration of native forest and woodlands adjacent to habitat critical to the survival to reduce edge effects.
- The control of Sugar Gliders in and adjacent to habitat critical to the survival in Tasmania.
- Actions that will help address knowledge gaps identified in this recovery plan.

When considering habitat loss, alteration or significant impacts to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a given location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

THREATS

3.1 Historical causes of decline

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011), and over 90 percent of Black Gum forest (Department of Environment and Energy 2018) has been cleared.

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the predation of nestlings and incubating females by the introduced Sugar Glider, ongoing loss of breeding and foraging habitat

through forestry operations, land clearing and wildfire. The main threats on the Australian mainland include habitat loss from land clearing for agriculture and urban development, and to a lesser extent forest harvesting. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change.

3.2.1 Habitat loss and alteration

Forestry and land clearing

Habitat loss in Tasmania through land clearing, native forest logging and intensive native forest silviculture practices poses the greatest threat to survival of the Swift Parrot population (Webb et al. 2017; Webb et al. 2019). Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017). Recent estimates of forest harvesting in the Southern Forests Swift Parrot Important Breeding Area in Tasmania shows that between 1997 and 2016, approximately 33 percent of all native eucalypt forest was converted to plantation or harvested, and 23 percent of the identified nesting habitat (i.e. old growth trees) which contained critical nest hollow resources for the species, was lost (Webb et al. 2019). As nesting hollows generally only occur in old trees and larger trees have proportionally more nectar and food resources, the harvesting of breeding and foraging habitat in native forests remains the most significant threat to the species' persistence in the wild.

A significant area of the Swift Parrot breeding habitat is subject to management arrangements under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA provides an alternative mechanism for delivery of the requirements for threatened species protection and recovery under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act. RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the *Tasmanian Forest Practices Act 1986*, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, and is intended to provide a stream-lined management process for threatened species in the context of wood production (FPA 2014).

Management arrangements have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al. 2004) which were erroneously considered a priority for the species, based on information existing at the time. In 2007 it was recognised that wet forests are just as crucial component of the breeding habitat for Swift Parrots (Webb 2008; Webb et al. 2014, 2017, 2019). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority 2014). Since Swift Parrot breeding habitat is poorly reserved in the National Reserve Network in Tasmania, there is considerable reliance on the protection measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas is urgently required to refine and ensure the effectiveness of these measures. Currently, there are no measures addressing habitat recruitment. The Tasmanian Forest Practices System has not protected all of the breeding habitat for the species, increasing the threats to the species (Webb et al 2019).

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The loss of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban and agricultural land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term

study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

Recent fires in Tasmania have destroyed and/or negatively impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for ‘human safety reasons’, including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species, which interacts synergistically with deforestation (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that survival of Swift Parrot nests was a function of modelled mature forest cover

in the surrounding landscape and the likelihood of Sugar Glider predation decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). The Tasmanian Government subsequently amended Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 to remove Sugar Gliders in 2018. Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows. An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and

bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data), or impacted by climate change.

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single

threat increase the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

By 2031, anthropogenic threats to Swift Parrot are demonstrably reduced.

By 2031, measure and sustain a positive population trend.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
2. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
3. Monitor and manage other sources of mortality.
4. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

5. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Identify known breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
1.2	Secure Tasmanian and Commonwealth Government commitment to support strategic planning for Swift Parrot breeding habitat	1	• The Public Authority Management Agreement (PAMA, under the TSPAct 1995) between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests is being implemented and monitored • Annual monitoring has occurred and an ongoing review of the implementation and effectiveness of the current management	**Australian Government** **Tasmanian Government** **Sustainable Timbers Tasmania**	Core government business

			recommendations has been undertaken • Recommendations from the ongoing review have been considered and implemented • An agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population between 2021-2031 has been completed and implemented		
1.3	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business
1.4	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset	**Australian Government** **State governments** **Local government**	Core government business

			regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan		
1.5	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa
1.6	Regulate firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat • Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**State governments** **Local government** **NRM regional bodies** **Private landholders**	$75,000 pa
1.7	Develop agreements with local government and government agencies that aim to maintain and enhance Swift Parrot breeding habitat	2	• Management agreements have been developed with local government and state government agencies which maintain and enhance Swift Parrot breeding habitat	**State governments** **Local government**	$150,000 pa

			• Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat	**NRM regional bodies** Private landholders	
1.8	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
1.9	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified • Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	**Australian Government** **State governments** **Local government** **NRM regional bodies** Private landholders BirdLife Australia NGOs	$150,000 pa

1.10	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 2**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
2.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped • A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa

2.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
2.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000 pa
2.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions • An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000
2.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success	**Tasmanian Government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• New knowledge has been incorporated into management interventions	NGOs Academic institutions	
2.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
2.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to Maria and Bruny Islands	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response protocols to eliminate Sugar Gliders on Maria and Bruny Islands	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$75,000 pa
2.8	Continue regulatory reform of Sugar Glider protected wildlife status	1	• The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core governmen t business

***Strategy 3**: Monitor and manage other sources of mortality*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
3.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
3.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000
3.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders**	$50,000

				BirdLife Australia NGOs	
3.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
3.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

Strategy 4*: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
4.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa

4.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
4.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
4.4	Maintain a free and openly available database for population, habitat and distributional data	2	• A free and openly available central repository for reporting monitoring observations has been identified • Relevant government databases have been maintained and updated on a regular basis • Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$50,000 pa
4.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to	**Recovery Team** **State governments**	$75,000

			inform management actions and priorities	**Research agencies** NGOs Academic institutions BirdLife Australia	
4.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

***Strategy 5**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management • Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
5.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns,	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa

			patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions		
5.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$140,000 pa
5.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

***Strategy 7**: Coordinate, review and report on recovery progress*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 2	$555,000	$475,000	$475,000	$475,000	$475,000	$2,455,000
Strategy 3	$125,000	$50,000	$50,000	$50,000	$50,000	$325,000
Strategy 4	$340,000	$275,000	$275,000	$200,000	$275,000	$1,365,000
Strategy 5	$415,000	$415,000	$665,000	$415,000	$415,000	$2,325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$30,000	$60,000	$30,000	$40,000	$190,000
TOTAL	$2,935,000	$2,715,000	$2,995,000	$2,640,000	$2,725,000	$14,010,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

January 2019

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Image credits

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Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered nesting sites or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Commented [A1]: Top priority, and needs to be Strategy 1

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population trajectory is positive.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to be undertaken to improve the species' long-term viability. This recovery plan supercedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no estimates of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar

Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

***Table 1**: National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (*Tasmania*)	Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable

2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

Commented [A2]: Add reference to Hingston (2019) Documenting demise? Sixteen years observing the Swift Parrot Lathamus discolor in suburban Hobart, Tasmania. *Australian Field Ornithology* 36: 97-108
for most recent measurements of declines in Swift Parrot populations

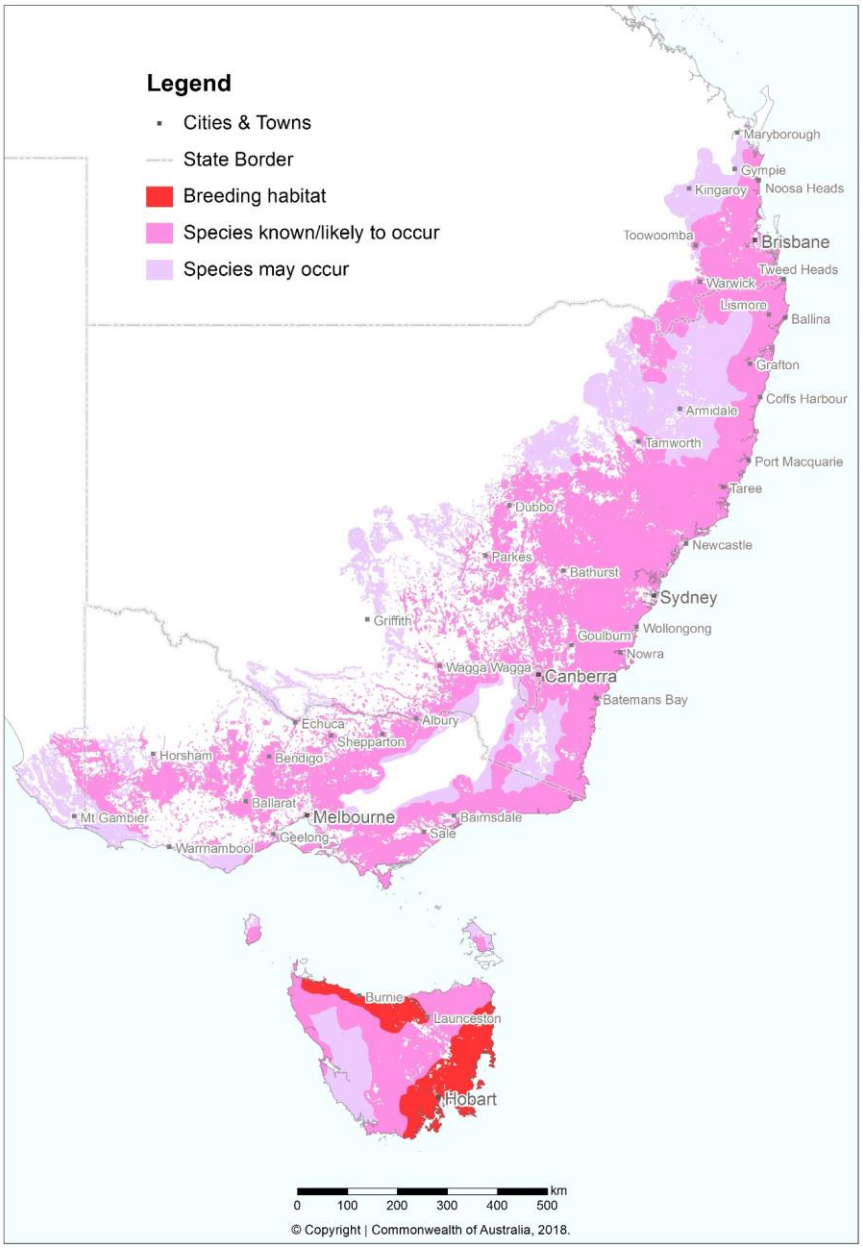

Figure 1 - Distribution of the Swift Parrot in Australia

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots spend the winter on mainland Australia and nest in Tasmania over summer. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia ~~maculate~~maculata*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000). The distribution of Swift Parrots across the landscape will vary depending on the flowering of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ovata*) flowering (Webb et al. 2014). The flowering

patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast. Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height of around 100cm, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, based on the DBH of identified nest trees most are likely much older than this.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017).

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting sites or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered breeding or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and sitting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). Recent estimates of ~~clearing~~ forest harvesting in the identified Southern Forests Swift Parrot Important Breeding Area in Tasmania suggests that between 1997 and 2016 approximately 33% of all eucalypt native forest ~~was lost through~~ converted~~sion of native forest~~ to plantation or disturbed through native forest harvesting, and 23% of the identified old growth forest was ~~lost~~ no longer old-growth as a result of disturbance (Webb et al. 2018). As nesting hollows generally only occur in trees older than about 100 years of age, and ~~that~~ larger trees have proportionally more nectar and food resources, the ongoing ~~logging~~ harvesting of breeding habitat remains a threat to the species' persistence in the wild.

Commented [A3]: Invert this order: predation is a much more serious short-term threat than habitat loss

Commented [A4]: The effects of native forestry operations should be considered separately to the conversion of native forests to plantations.

Note also that no old-growth forest was converted to plantation, and that all conversion of public native forest to plantation ceased about 2008.

Commented [A5]: This reference is to forest clearing for agriculture, not forestry – move elsewhere

Commented [A6]: Not clearing

Commented [A7]: The term 'harvesting' is used generally through the document.

In Tasmania, the forests that the Swift Parrot breed in are subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999) and operations undertaken as part of the RFA do not need to be assessed against the provisions in the Act. Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, intended to provide a stream-lined risk assessment process for threatened species in the context of wood production (FPA 2014).

Commented [A8]: More specifically, recently, and importantly, 'Under the Tasmanian Regional Forest Agreement, '

The agreed procedures refer to measures to protect Swift Parrot breeding habitat. These measures have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested that wet forests were part of breeding habitat for Swift Parrots, particularly during periods when *E. globulus* flowering was poor in dry forests (Webb 2008; Law et al. 2000). The current measures for the management of Swift Parrot habitat ~~-~~cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority, 2014). Since Swift Parrot breeding habitat is poorly reserved (in the formal CAR reserve system) in Tasmania there is considerable reliance on the measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas (Koch and Munks, 2018 in press) is urgently required to refine and ensure the effectiveness of these measures.

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~~Logging~~ Harvesting of foraging habitat on the Australian mainland also remains a threat. The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial ~~logging~~ harvesting operations, on the mainland remain uncertain.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too ~~regular~~short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and

increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Mortality risks to Swift Parrots from window-strike and from flying into fences (Hingston 2019) has also been documented previously and represents and ongoing threat to the species in urbanised areas.

Commented [A9]: Hingston (2019) Documenting demise? Sixteen years observing the Swift Parrot Lathamus discolor in suburban Hobart, Tasmania. *Australian Field Ornithology* 36: 97-108

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Commented [A10]: Is the most significant threat so move to start of this section and cover in more detail. That would then underpin the preponderance of actions in regards to predation in the subsequent strategies

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding areas. However, predation on the nest by Sugar Gliders on the mainland of Tasmania is now considered to be ~~as~~ the most significant ~~a~~ short-term threat to the species ~~as habitat loss~~, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). Stojanovic et al. also found that on the Tasmanian mainland, modelled survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and ~~suggested~~ showed further modelling that indicated that the likelihood of sugar glider predation decreased with increasing forest cover. While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Commented [A11]: The idea that likelihood of sugar glider predation decreases with increasing forest cover is contentious – see edits earlier in the sentence. It is possibly the case, but is not well evidenced

Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Commented [A12]: Hingston (2019) Documenting demise? Sixteen years observing the Swift Parrot Lathamus discolor in suburban Hobart, Tasmania. *Australian Field Ornithology* 36: 97-108

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the Environment Protection and Biodiversity Conservation Act 1999 listing criteria.

Recovery Plan Objective

To achieve and sustain a positive population trend for the Swift Parrot over the life of this Recovery Plan. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
2. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Commented [A13]: Should be Strategy 1

8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Commented [A14]: It would be good to give a higher priority to actions that can be taken now (Priority 1A?)

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research BirdLife

Strategy 2: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat.	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations. • Recommendations from ongoing review considered and implemented. • Completion and implementation of an agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years. • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests.	DoEE DPIPWE STT FPA
2.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research

Commented [A15]: Action 2.1 is fine as an 'overview' action, but should not come before a specific action to mitigate threat from forest harvesting by relocating elsewhere harvesting that is planned in important breeding areas. The details, processes and consequences can reside in other documents, as can the circumscription of 'important breeding areas' for this action, but the action needs to be specified here so it can be picked up in the Tasmanian Forest Practices System

2.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture) through local, state and Commonwealth Government legislation.	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	DoEE DPIPWE OEH DEHP DELWP
2.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide foraging habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research BirdLife NGOs
2.5	Regulate firewood collecting	1	• Quantify the extent of illegal firewood harvesting in breeding habitat. • Enforcement action targeted at reducing illegal firewood harvesters. • Certification system introduced for legal firewood harvesters to demonstrate wood is harvested in accordance with codes of practice.	DPIPWE
2.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
2.7	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented.	OEH DEHP DELWP

			• Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	
2.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP BirdLife NGOs
2.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP BirdLife NGOs

Strategy 3: Reduce impacts from Sugar Gliders at breeding sites

Commented [A16]: Should be Strategy 1

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness~~,~~ and implemented.	Research
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the impacts of directly reducing Sugar Glider density (through trapping and euthanising) on Swift Parrot breeding mortality and success.	Research
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of	Research

			Sugar Gliders in south-east Tasmania	
3.5	Further investigate the possible link between forest condition, Sugar Glider density and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
3.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DPIPWE Research BirdLife
3.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key locations over the breeding season. • Strategy implemented.	DPIPWE Research
3.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DPIPWE Research BirdLife
3.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 4: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action	**Priority**	Performance Criteria	Responsible Agencies *and potential partners*

4.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan, with a focus on identifying key nesting and foraging areas.	Research
4.2	Undertake fine-scale mapping of breeding habitat to inform management.	1	• Fine-scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine-scale management.	Research
4.3	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season. • Winter survey program implemented on an annual basis over the life of this recovery plan.	Research BirdLife OEH
4.4	Better understand site use, landscape use and habitat bottlenecks.	2	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad-scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research BirdLife OEH DELWP
4.5	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies.	2	• Existing knowledge of breeding success, survival and mortality expanded. • Research to include focus on establishing effectiveness of recovery plan actions.	Research
4.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	Research BirdLife

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP BirdLife Research
5.3	Encourage appropriate building design and tree plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas.	DPIPWE BirdLife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web. • Informative displays are developed to educate the community.	BirdLife Research
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate.	2	• Maintain a network of volunteers to help assist with regional surveys. • Where appropriate, provide opportunities for the citizen scientists to participate in academic research projects related to recovery actions	BirdLife Research
6.3	Engage Indigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Undertake targeted consultation with Indigenous landholders to identify ways to increase	All

			engagement in recovery plan actions. • Where appropriate, engage Indigenous groups in implementation activities.	
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Strategy 7: Coordinate, review and report on recovery process

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

Costing of this Recovery Plan will be undertaken during public consultation process.

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), South-eastern Red-tailed Black-~~-~~Cockatoo (*Calypt~~h~~orhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to

modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat will impact on some landowners, managers and developers. These restrictions may not significantly impact on agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. ~~The management of forestry operations is carried out under the provisions of the~~Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements through which the Commonwealth accredits state government systems and codes of practices. ~~with the management prescriptions being developed and implemented by~~ Constitutional responsibility for forest management lies with the State Governments, who therefore develop and administer the forest management prescriptions. ~~and the associated forestry managers~~.

A large network of community volunteers across eastern Australia actively participate in BirdLife Australia coordinated annual surveys for Swift Parrots. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliable~~y~~ seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular through the summer breeding season. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organisations, to categorise ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included

representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan.

The review will be coordinated by the Department of the Environment and Energy in association relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment and Energy

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania – DPIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations
Swift Parrot Recovery Team

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Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from:
http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, measure and sustain a positive population trend.

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery process.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team includes individuals from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014). Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

Commented [A1]: This ranking of the various threats to Swift Parrot is good, but it is not reflected throughout the rest of this final draft Recovery Plan

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across mainland jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in knowledge and scientific evidence (Webb et al. 2019). The Swift Parrot is Critically Endangered, and therefore urgent action is needed to save the species from extinction. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, such as the Public Authority Management Agreement covering the Southern Forests in Tasmania, there remain many unresolved challenges for habitat protection. For example, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues despite extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of deforestation (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

Commented [A2]: Non-sequitur. Swift Parrot was not elevated to Critically Endangered because of habitat loss, but because of predation from introduced sugar gliders. Habitat protection is therefore not the main issue – yet the Recovery Plan goes directly to the minor threat (to habitat) rather than the major threat.

Commented [A3]: This recovery plan requires updating to account for the latest information

Commented [A4]: As above – don't focus immediately on habitat protection. It is important, and certainly not the main game, and in any case us being addressed

Commented [A5]: Again, Webb et al. 2019 is a highly contentious paper, and is not accepted by all workers in this area. Its uncritical requoting here is risky

Commented [A6]: This relationship is contentious and weakly supported by the published data

Commented [A7]: "deforestation" is the permanent removal of tree cover. Was Stojanovic et al referring to forest harvesting, or land clearing for agriculture, or both? While forest harvesting does affect the Swift Parrot breeding habitat, it is not permanent so doesn't count as deforestation. Clearing for agriculture is permanent and meets the definition of deforestation.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east regions of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low, probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, The Action Plan for Australian Birds, suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011) but has declined since and was estimated to be 750 (range 300-1000) mature individuals in 2020 (Webb et al. 2021). Based on genetic data, the effective population size (N_e) is 60–338 individuals (Olah et al. in review).

Commented [A8]: Is this the paper recently published (early December) in *Animal Conservation*?

While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in

numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

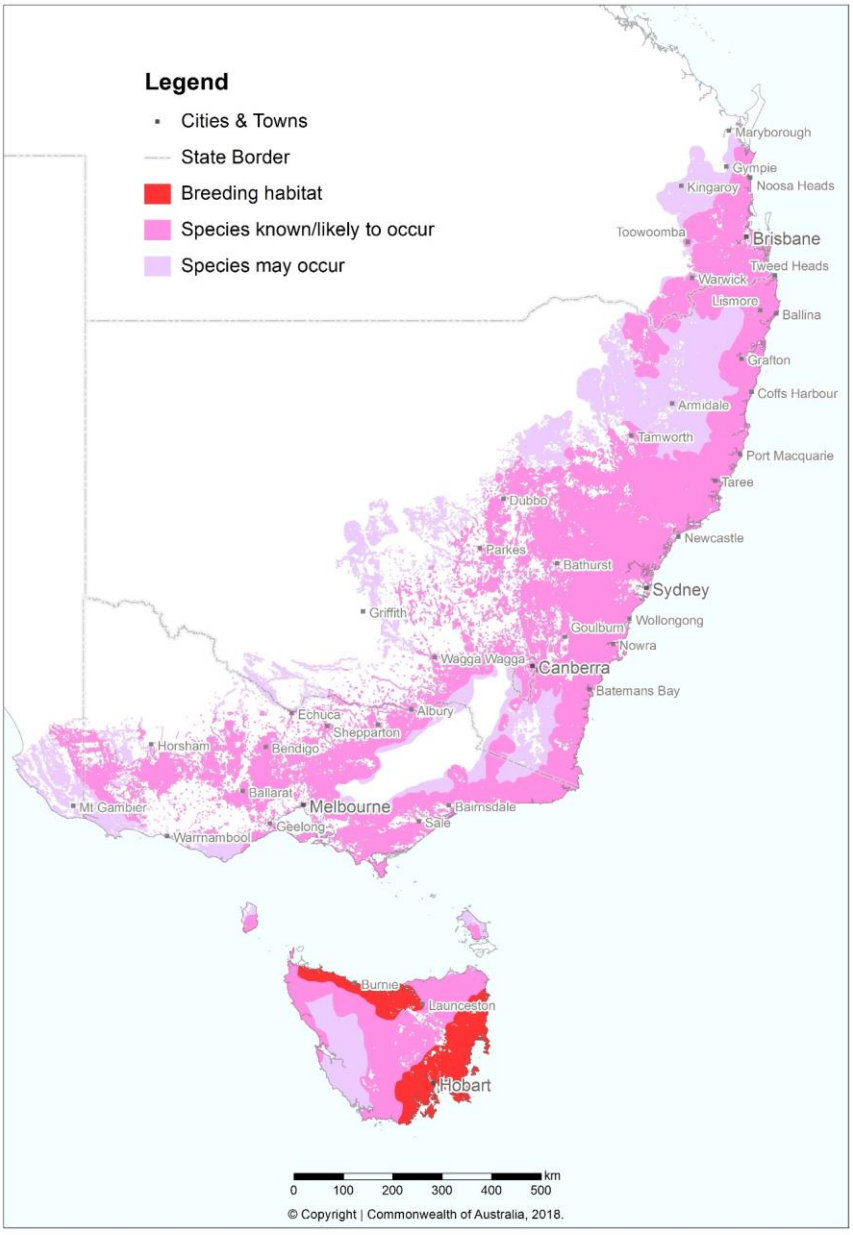

Figure 1 – Indicative distribution of the Swift Parrot in Australia

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005). Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time.

Commented [A9]: This is a recommendation/action, not a description of habitat, so doesn't seem to belong here.

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 1). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et

al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide a temporary local food resource in some years. In the north-west, Black Gum forest may represent the primary foraging resource. Similarly, in years with little Blue Gum flowering, Black Gum can comprise the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8 eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the

female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This process is guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

Commented [A10]: So is Swift parrot a Trigger species?

It is difficult to see how the inclusion of this info on KBAs helps describe the habitat or biology of the species any more than is already done so in sections 2.5, 2.6 & 2.8.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However, existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many

KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 ~~Key Biodiversity Areas~~KBAs as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.
- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.
- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.
- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State

Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark

Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot.
- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Swift Parrots and Endangered Forty-spotted Pardalotes.
- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula. The area has been identified as a KBA because it contains almost all the breeding habitat of the Swift Parrot on the Tasmanian mainland.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

Habitat critical to the survival for the Swift Parrot includes:

Breeding habitat in Tasmania

- All native forest and woodland containing Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species within the known breeding areas. Known breeding areas are areas containing known nest records and areas deemed as important for breeding by species specialists.
- All known nest trees, as well as forest and woodland containing potential nesting trees within the known breeding areas. Potential nesting trees typically contain hollows, have a large trunk diameter at breast height, and have signs of senescence (i.e. contain dead wood).

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*) having a diameter at breast height of 60 cm or greater.

Habitat for the long-term maintenance of the species

- Suitable habitat within all Key Biodiversity Areas with Swift Parrot as a Trigger species.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. It is essential that ~~the~~ protection is provided to these areas and that enhancement and protection measures target these productive sites. Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed.

When considering habitat loss, alteration or significant impacts to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a give location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

THREATS

3.1 Historical causes of decline

Commented [A11]: Focussing on habitat, as usually the case for Recovery Plans, is less appropriate here as the main threat (predation by sugar gliders) is not driven by habitat availability or conditions. Habitat free of sugar gliders is more important than identical habitat with sugar gliders present. The Recovery Plan therefore needs to be worded so as to avoid the impression that protection of critical habitat is the most important action.

Commented [A12]: "the protection" is an odd term. Is it meant to say "It is essential that protection is provided…"?

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011), and over 90 percent of Black Gum forest (Department of Environment and Energy 2018) has been cleared.

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the predation of nestlings and incubating females by the introduced Sugar Glider, ongoing loss of breeding and foraging habitat through forestry operations, land clearing and wildfire. ~~This is compounded by predation of nestlings and incubating females by the introduced Sugar Glider, which is worst in areas of severe deforestation (Stojanovic et al. 2014)~~. The main threats on the Australian mainland include habitat loss from land clearing for ~~, forestry,~~ agriculture and urban development, and to a lesser extent forest harvesting. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. Preventing, reducing and managing threats is the primary focus of this recovery plan.

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

3.2.1 Habitat loss and alteration

Forestry and land clearing

Ongoing habitat loss in Tasmania through land clearing, native forest logging and intensive native forest silviculture practices poses the greatest threat to survival of the Swift Parrot population (Webb et al. 2017; Webb et al. 2019). Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017). Recent estimates of forest harvesting in the Southern Forests Swift Parrot Important Breeding Area in Tasmania shows that between 1997 and 2016, approximately 33 percent of all native eucalypt forest was converted to plantation ~~or lost to clear-fell native forest logging~~harvested, and 23 percent of the identified nesting habitat (i.e. old growth trees) which contained critical nest hollow resources for the species, was lost (Webb et al. 2019). As nesting hollows generally only occur in old trees and larger trees have proportionally more nectar and food resources, the ongoing harvesting of

Commented [A13]: Factually incorrect. This is simply not the case, and contradicts text in the Recovery Plan above (e.g. p.7, pp.9-10) as well as the formal Population Viability Analysis of Heinsohn et al (2015). Predation by sugar gliders is the main threat to the survival of Swift Parrot, and its recognition was sufficient to trigger relisting of the species as Critically Endangered.

Commented [A14]: Incorrect. Predation may be compounded by forestry operations (although the modelled relationship is weak), not the other way around.

Commented [A15]: As per previous comment.

Commented [A16]: Agriculture per se is not a threat. Land clearing for agriculture is.

Commented [A17]: As the main threat, put first.

Commented [A18]: This appears to be a recommendation for actions, not a description of the Current Threatening process.

Commented [A19]: This needs to be separated into two sections, (i) forestry and (ii) land clearing. Forest harvesting does not involve land clearing, loss of forest, or deforestation. Overall, discussion needs to be about habitat quality, which is more subtle and much less emotive – but is the parameter to which the species actually responds. Forest harvesting needs to occur under management prescriptions that maintain habitat quality

Commented [A20]: Again, not the case – see above. Focussing on this particular claim will lead to misplaced actions that maintain the major threat to the species.

Commented [A21]: Historical data, but the description of these figures is also disputed. Native forest is not 'lost' to clearfelling.

Commented [A22]: Forest harvesting does not equal forest loss.

Commented [A23]: No, historical not ongoing. Reference is needed to recent developments ongoing post-PAMA/Threatened Fauna Adviser

breeding and foraging habitat in native forests remains the most significant threat to the species' persistence in the wild.

A significant area of the Swift Parrot breeding habitat is subject to management arrangements under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is intended to be consistent with the requirements for threatened species protection and recovery under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act. RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the *Tasmanian Forest Practices Act 1986*, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, and is intended to provide a stream-lined management process for threatened species in the context of wood production (FPA 2014).

Management arrangements have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al. 2004) which were erroneously considered a priority for the species, based on information existing at the time. In 2007 it was recognised that wet forests are just as crucial component of the breeding habitat for Swift Parrots (Webb 2008; Webb et al. 2014, 2017, 2019). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority 2014). Since Swift Parrot breeding habitat is poorly reserved in the National Reserve Network in Tasmania, there is considerable reliance on the protection measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas is urgently required to refine and ensure the effectiveness of these measures. Currently, there are no measures addressing habitat recruitment. The Tasmanian Forest Practices System has not protected all of the breeding habitat for the species, increasing the threats to~~RFA has failed to adequately protect Swift Parrots in their breeding range because large areas of potential or known habitat have been logged, despite potential impacts on~~ the species (Webb et al 2019).

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The harvesting of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, ~~for forestry~~ reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban and agricultural land clearing and commercial harvesting operations on the mainland remain uncertain.

Commented [A24]: The Tas RFA was amended in 2017.

Commented [A25]: Better "provides an alternative mechanism for delivery of the requirements for". "Intended" suggests that the author believes consistency is not attained but is not willing to say this

Commented [A26]: Correct, but important to add that RFAs accredit state-based forest practices systems – else logic is unclear

Commented [A27]: Again - please update to incorporate the revised management arrangements under the 2020 Public Authority Management Agreement.

Commented [A28]: This statement is incorrect and a significant sensitivity for both the Australian Government and Tasmanian Government in its current form.

Commented [A29]: Second, need specific reference to both the 2020 PAMA, and to the advice contained in the Threatened Fauna Adviser

Commented [A30]: While historical forest harvesting has impacted Swift Parrot breeding habitat, it is not the main threat to the species. Secondly, following the logic in the previous paragraph, the phrasing here should refer to the Tasmanian Forest Practices System, not the RFA.

Commented [A31]: Harvesting ceased in the Victorian box-ironbark woodlands in the 2000's.

There may be ongoing clearing for agriculture/development but that is different to forestry.

Commented [A32]: Urban and agricultural

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

Recent fires in Tasmania have destroyed and/or negatively impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between

10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species, which interacts synergistically with deforestation (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that modelled survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and the likelihood of Sugar Glider predation was modelled to decreased with increasing forest cover.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows. An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift

Commented [A33]: The most significant threat so put first

Commented [A34]: Forest cover is at most a minor influence, even if the modelled relationship is correct, so do not use it to distract from major threat – predation.

Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data), or impacted by climate change.

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10

years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014) and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single threat increase the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, measure and sustain a positive population trend.

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objectives

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa
1.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
1.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
1.4	Maintain a free and openly available database for	2	• A free and openly available central repository for reporting monitoring	**Recovery Team**	$50,000 pa

	population, habitat and distributional data		observations has been identified • Relevant government databases have been maintained and updated on a regular basis • Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	**State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	
1.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to inform management actions and priorities	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
1.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

Commented [A35]: Already done – see Heinsohn et al (2015). Not obvious that there is sufficient new data to merit repeating.

***Strategy 2**: Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
2.1	Identify known breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
2.2	Secure Tasmanian and Commonwealth Government commitment to support strategic planning for Swift Parrot breeding habitat	1	• The ~~completion of the~~ Public Authority Management Agreement (PAMA, under the TSPAct 1995) ~~has occurred~~ between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests is being implemented and monitored. • Annual monitoring has occurred and an ongoing review of the implementation and effectiveness of the current management	**Australian Government** **Tasmanian Government** **Sustainable Timbers Tasmania**	Core government business

Commented [A36]: What does this action achiev/change in an operational sense?

Commented [A37]: The signing of the PAMA was announced in August 2020. Rewrite actions now that PAMA is in place

			recommendations has been undertaken • Recommendations from the ongoing review have been considered and implemented • An agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population between 2021-2031 has been completed and implemented		
2.3	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business
2.4	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset	**Australian Government** **State governments** **Local government**	Core government business

			regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan		
2.5	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa
2.6	Regulate firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat	**State governments** **Local government**	$75,000 pa

			• Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**NRM regional bodies** **Private landholders**	
2.7	Develop agreements with local government and government agencies that aim to maintain and enhance Swift Parrot breeding habitat	2	• Management agreements have been developed with local government and state government agencies which maintain and enhance Swift Parrot breeding habitat • Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat	**State governments** **Local government** **NRM regional bodies** Private landholders	$150,000 pa
2.8	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
2.9	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified • Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection	**Australian Government** **State governments** **Local government** **NRM regional bodies**	$150,000 pa

			for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	Private landholders BirdLife Australia NGOs	
2.10	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 3**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Commented [A38]: Should be Strategy 1

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
3.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped • A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$50,000 pa

			density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	Academic institutions	
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions • An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000
3.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
3.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed	**Tasmanian Government** **NRM regional bodies**	$75,000 pa

	Maria and Bruny Islands		but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response protocols to eliminate Sugar Gliders on Maria and Bruny Islands	**Research agencies** NGOs Academic institutions	
3.8	Undertake regulatory reform of Sugar Glider protected wildlife status	1	• Sugar Gliders have been removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 • The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core governmen t business

***Strategy 4**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
4.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management	**State governments** **Local government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	NGOs Academic institutions	
4.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns, patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa
4.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$140,000 pa

				Academic institutions	
4.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 5**: Monitor and manage other sources of mortality*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
5.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000
5.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders**	$50,000

				BirdLife Australia NGOs	
5.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
5.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

Strategy 7: Coordinate, review and report on recovery progress

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$200,000	$200,000	$200,000	$200,000	$350,000	$1,150,000
Strategy 2	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 3	$455,000	$425,000	$475,000	$425,000	$425,000	$2,205,000
Strategy 4	$475,000	$475,000	$725,000	$475,000	$475,000	$2,625,000
Strategy 5	$50,000	$125,000	$50,000	$50,000	$50,000	$325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$60,000	$30,000	$30,000	$40,000	$190,000
TOTAL	$2,680,000	$2,755,000	$2,950,000	$2,650,000	$2,810,000	$13,845,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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Australian Government
Department of Agriculture, Water and the Environment

National Recovery Plan for the Swift Parrot

Lathamus discolor

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from:
http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

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Contents

SUMMARY

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*:* Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory): Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales): Endangered
Nature Conservation Act 1992 (Queensland): Endangered
National Parks and Wildlife Act 1972 (South Australia): Endangered
Threatened Species Protection Act 1995 (Tasmania): Endangered
Flora and Fauna Guarantee Act 1988 (Victoria): Threatened

IUCN Red List of Threatened Species*:* Critically Endangered

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objective

By 2031, measure and sustain a positive population trend.

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery process.

Criteria for success:

This recovery plan will be deemed successful if, by 2031, all of the following have been achieved:

- The Swift Parrot population has a positive ongoing population trend, as a result of recovery actions.
- There has been an improvement in the quality and extent of Swift Parrot habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

Recovery team:

Recovery teams provide advice and assist in coordinating actions described in recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species. The national Swift Parrot Recovery Team has the responsibility of providing advice, coordinating and directing the implementation of the recovery actions outlined in this recovery plan. The membership of the national Recovery Team includes individuals from relevant government agencies, non-government organisations, industry groups, species experts and expertise from independent researchers and community groups.

INTRODUCTION

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions needed to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It was listed as Endangered under the EPBC Act in 2000, however the listing status of the Swift Parrot was re-assessed in 2016 due to new information showing a significant threat from predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*) (Stojanovic et al. 2014). Sugar Glider impacts in Tasmania are compounding and adding to the already recognised threats to the Swift Parrot, including habitat loss and alteration and Australia's changing climate. The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of threatened species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

Commented [A1]: Correct. Unfortunately this ranking of the various threats to Swift Parrot is not reflected in this final draft Recovery Plan

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across mainland jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that population trend information for Swift Parrots remained uncertain, as there was no estimate of population size or equivalent indices that could be used to estimate a population trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it was demonstrated that the population was likely declining.

The Review also concluded that at the time of writing the 2011 Recovery Plan, the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and address the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as Critically Endangered under the EPBC Act, and listed threatened in all parts of its range (Table 1). The last 20 years of Swift Parrot conservation have shown that conservation efforts have been insufficient to halt the species' decline. Despite extensive outreach to the public and policy makers, conservation management has not kept pace with advances in knowledge and scientific evidence (Webb et al. 2019). The Swift Parrot is Critically Endangered, and therefore urgent action is needed to save the species from extinction. While some Swift Parrot habitat has been protected in conservation reserves in Tasmania and mainland states, and some timber harvesting prescriptions imposed to moderate the impact of forestry, there remain many unresolved challenges for habitat protection. For example, one third of the species' Tasmanian habitat in the state's southern forests has been lost over the last 20 years. This practice continues despite extensive evidence demonstrating that the cessation of logging of Swift Parrot breeding habitat in Tasmania is urgently required to secure the species (Webb et al. 2019). Sugar Glider impacts in Tasmania are worst where habitat loss is severe, which compounds the effects of deforestation (Stojanovic et al. 2014). Climate change poses an additional threat to the species, but its consequences are poorly studied. If habitat continues to be lost across the species' range, and Sugar Glider predation is not addressed, the species will likely continue its downward trajectory and become extinct in the wild.

Commented [A2]: Non-sequitur. Swift Parrot was not elevated to Critically Endangered because of habitat loss, but because of predation from introduced sugar gliders. Habitat protection is therefore not the main issue – yet the Recovery Plan goes directly to the minor threat (to habitat) rather than the major threat.

Commented [A3]: As above – don't focus immediately on habitat protection. It is important, and certainly not the main game, and in any case us being addressed

Commented [A4]: Again, Webb et al. 2019 is a highly contentious paper, and is not accepted by all workers in this area. Its uncritical requoting here is risky

Commented [A5]: This relationship is contentious and weakly supported by the published data

Table 1: National and state conservation status of the Swift Parrot

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Critically Endangered
Nature Conservation Act 2014 (Australian Capital Territory)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Threatened Species Protection Act 1995 (Tasmania)	Endangered

2.2 Species description

The Swift Parrot (White, 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

2.3 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is mainly in the east and south-east regions of Tasmania, with the location of breeding each year being determined largely by the distribution and intensity of Blue Gum (*Eucalyptus globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent between years (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however, the number of birds involved is low, probably because the remaining breeding habitat is scarce and highly fragmented. Swift Parrots have also been found breeding on the west coast of Tasmania near Zeehan, and on King and Flinders Islands (M. Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

2.4 Population and trends

The Swift Parrot occurs as a single, panmictic migratory population (Stojanovic et al. 2018). In 2010, The Action Plan for Australian Birds, suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011) but has declined since and was estimated to be 750 (range 300-1000) mature individuals in 2020 (Webb et al. 2021). Based on genetic data, the effective population size (N_e) is 60–338 individuals (Olah et al. in review).

While the current population size is uncertain, recent research has shown it is likely undergoing dramatic declines due to predation by Sugar Gliders (Heinsohn et al. 2015). Sugar Gliders are an introduced species to Tasmania (Campbell et al. 2018), and their impacts on Swift Parrots compound and add to other known threats including habitat loss and degradation. Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were absent. Most cases of glider predation resulted in the death of the adult female, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al. 2014; Webb et al. 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in

numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used different generation times for Swift Parrots.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et al. 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al. 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al. 2015). More recent evidence shows that high predation by Sugar Gliders at some breeding sites has resulted in a change to the Swift Parrot mating system due to the rarity of adult females, resulting in even worse projected population declines based on PVA (Heinsohn et al. 2019).

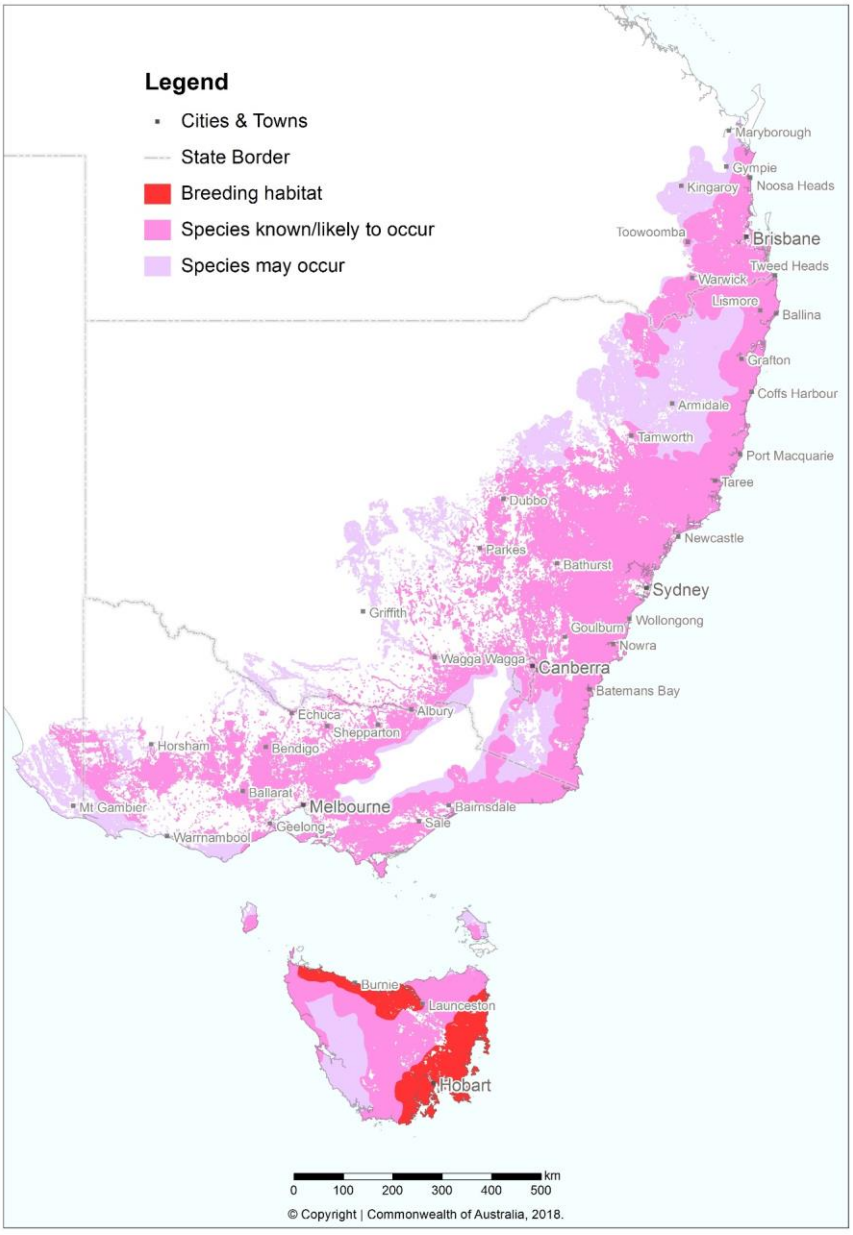

Figure 1 – Indicative distribution of the Swift Parrot in Australia

2.5 Habitat

2.5.1 Mainland habitat

Swift Parrots spend the winter on mainland Australia (Figure 1). During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. Within these habitats, Swift Parrots preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

Key foraging species includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*). Swift Parrots rely heavily on lerp for food. Lerps are protective covers made by nymphs (a larval stage that resembles adults) of jumping plant lice or psyllids (Family: Psyllidae). Nymphs excrete honeydew on the leaf surface and the sugars and amino acids in the honeydew crystallise in the air to form lerps. Leaves can look black and sooty when moulds grow on the honeydew. Lerp size and shape varies between species of psyllid. On mainland Australia Swift Parrots are regularly found feeding on lerp, with flocks of up to 50 birds feeding on lerp for up to an entire season, sometimes choosing to eat lerp despite the nearby availability of nectar resources (BirdLife Australia pers. comm.).

The distribution of Swift Parrots across the landscape will vary depending on the flowering phenology of key foraging species. Due to the variable production of nectar and lerps it is considered critically important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Kennedy and Tzaros 2005). Where habitat loss continues to occur within foraging habitats on the mainland, it is important to retain trees ≥ 60 cm diameter at breast height (DBH) or greater, together with at least five trees per hectare from a mixture of other age classes (30-40 cm, 40-50 cm and 50-60 cm DBH) to ensure continuity of food resources over time.

2.5.2 Tasmanian breeding and foraging habitat

Breeding records for Swift Parrots are largely restricted to the south and east coast of Tasmania, including Bruny and Maria islands, with some sporadic breeding occurring in the north of the state (Figure 1). The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of Blue Gum (*E. globulus)* and Black Gum (*E. ovata*) flowering (Webb et al. 2014). The flowering patterns of these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift Parrots nest in any eucalypt forests and woodlands which contain tree hollows, provided that flowering trees are nearby (Webb et al. 2017). Nesting occurs in the hollows of live and dead eucalypt trees. There is no evidence that suggests Swift Parrots prefer any particular tree species for nesting, instead, the traits of tree cavities are the main factor that predicts whether a tree is used as a nest (Stojanovic et al. 2012). Nest sites have been recorded in a range of dry and wet eucalypt forest types, and Swift Parrots exhibit little preference for vegetation communities, and instead respond to the configuration of resources in the landscape (Webb et al. 2014; 2017).

Nest trees are typically characterised by having a diameter at breast height of around 80 cm or greater, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et

al. 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch et al. 2008). However, some nest trees can be smaller, or much larger, and tree size varies between forest types. The tree hollows preferred for nesting have small entrances (~5 cm), deep chambers (~40 cm) and ~12cm wide floor spaces (Stojanovic et al. 2012). These traits are rare, and only 5 per cent of tree hollows in a given forest area may meet these criteria. Suitable hollows are important because they act as a passive form of nest defence against native Tasmanian nest predators, however these defences are ineffective against Sugar Gliders (Stojanovic et al. 2017).

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where Swift Parrot nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of nesting areas for the species' long-term viability. The presence of a foraging resource influences whether an area is suitable on a year-to-year basis (Webb et al. 2014).

Blue Gum and Black Gum forests and any other communities where Blue Gum or Black Gum is subdominant (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) are important foraging habitats (Webb et al. 2014; 2017). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide a temporary local food resource in some years. In the north-west, Black Gum forest may represent the primary foraging resource. Similarly, in years with little Blue Gum flowering, Black Gum can comprise the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton et al. (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season, Swift Parrots often feed on lerps, wild fruits such as Native Cherry (*Exocarpos cupressiformis*) and the seeds of introduced eucalypts and callistemon species. The relative importance of these other food sources during the breeding season is not well understood.

Non-breeding dispersal and post-breeding habitat can be anywhere in Tasmania, including forests in the west and north-west. The species has been observed feeding on flowering Stringybark, Gum-topped Stringybark, White Gum, Mountain Gum (*E. dalrympleana*), Cabbage Gum (*E. pauciflora*) and Smithton Peppermint (*E. nitida*) (Swift Parrot Recovery Team 2001).

2.6 Breeding biology

Birds arrive in Tasmania in early August and breeding occurs between September and January. Both sexes search for suitable nest hollows, which begins soon after birds arrive in Tasmania. Nesting commences in late September, however birds that are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree (Stojanovic et al. 2012; Webb et al. 2012).

The female occupies the nest chamber for several weeks before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The mean clutch size is 3.8 eggs but up to six eggs may be laid, and the mean number of fledglings produced is 3.2 (Stojanovic et al. 2015). During incubation the male visits the nest site every three to five hours to feed the

female. The male perches near the nest and calls the female out, either feeding her at the nest entrance or after both birds fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of Blue and/or Black Gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015). Swift Parrots moderate the impact of local fluctuations in food availability by nesting wherever food abundance is high, and so have relatively low variation in the number or quality of nestlings produced between different years and breeding sites (Stojanovic et al. 2015).

Male Swift Parrots provision their nestlings using food resources that typically occur within 5 km of their nests, but the further they fly to feed, the poorer their overall reproductive success may become (Stojanovic et al. *in review*). Evidence from telemetry shows that in years where food is abundant, provisioning males may forage within 1 km of the nest, whereas when food is scarce trips up to 9 km from the nest have been recorded (Stojanovic et al. *in review*).

Swift Parrots sometimes utilise artificial nesting sites, however occupancy of nest boxes is highest when nearby natural nesting sites are saturated with Swift Parrots, and nest boxes are a second preference for nesting (Stojanovic et al. 2019).

2.7 Key biodiversity areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This process is guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria have quantitative thresholds and can be applied to species and ecosystems in terrestrial, inland water and marine environments. These thresholds ensure that only those sites with significant populations of a species or extent of an ecosystem are identified as global KBAs. Species or ecosystems that are the basis for identifying a KBA are referred to as Trigger species.

The global KBA partnership supports nations to identify KBAs within their country by working with a range of governmental and non-governmental organisations scientific species experts and conservation planners. Defining KBAs and their management within protected areas or through Other Effective Area-based Conservation Measures (OECMS) will assist the Australian Government to meet its obligations to international treaties, such as the Convention on Biological Diversity. KBAs are also integrated in industry standards such as those applied by the Forest Stewardship Council or the Equator Principles adopted by financial institutions to determine environmental risk in projects.

The initial identification of a site as a KBA is tenure-blind and unrelated to its legal status as it is determined primarily based on the distribution of one or more Trigger species at the site. However, existing protected areas or other delineations such as military training area or a commercial salt works will often inform the final KBA delineation, because KBAs are defined with site management in mind (KBA Standards and Appeals Committee 2019). In practice, if an existing protected area or other designation roughly matches a KBA, it will generally be used for delineating the KBA. Many

KBAs overlap wholly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, Indigenous or community conserved areas). However, not all KBAs are protected areas and not all protected areas are KBAs. It is recognised that other management approaches may also be appropriate to safeguard KBAs. In fact, research from Australia and elsewhere demonstrates the value of OECMS measures in conserving KBAs and their Trigger species (Donald et al. 2019) if the site is managed appropriately The identification of a site as a KBA highlights the sites exceptional status and critical importance on a global scale for the persistence of the biodiversity values for which it has been declared for (particular Trigger species or habitats) and implies that the site should be managed in ways that ensure the persistence of these elements. For more information on KBAs visit - http://www.keybiodiversityareas.org/home

The global KBA partnership currently recognises 18 Key Biodiversity Areas as important for Swift Parrot conservation and to support the long-term persistence of the species. KBAs are also undergoing a regular revision to ensure changes in IUCN red list status, taxonomic changes, local population trends as well as increased knowledge of the species are reflected accurately in the KBA network. As such, over time, additional KBAs may be recognised for their importance for Swift Parrot or new KBAs may be declared for this and other taxa. Detailed KBA Factsheets, including boundary maps, population estimates of trigger species and scientific references are for these 18 areas (and other KBAs) are available from the World Database of Key Biodiversity Areas (BirdLife International 2020). The 18 KBAs with Swift Parrot as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2009 based on the analysis BirdLife Australia. They include:

New South Wales

- Brisbane Water – Brisbane Water is a wave-dominated barrier estuary located in the Central Coast region, north of Sydney, New South Wales. Some 2,277 hectares of Brisbane Water is classified as KBA because it has an isolated population of Bush Stone-curlews and supports flocks of the Critically Endangered Regent Honeyeater and Swift Parrot during autumn and winter, when the Swamp Mahogany trees are in flower.
- Capertee Valley – The Capertee Valley is the second largest canyon (by width) in the world and largest valley in New South Wales, 135 km north-west of Sydney. Parts of the valley are included in the Wollemi National Park, the second-largest national park in New South Wales. The valley is classified as a KBA because it is the most important breeding site for the Critically Endangered Regent Honeyeater. It also supports populations of the Painted Honeyeater, Rockwarbler, Swift Parrot, Plum-headed Finch and Diamond Firetail.
- Hastings-Macleay – The Hastings-Macleay KBA is a 1,148 km^2 tract of land stretching for 100 km along the Mid North Coast of New South Wales, from Stuarts Point in the north to the Camden Haven River in the south. The area was identified by BirdLife International as an KBA because it regularly supports significant numbers of the Critically Endangered Swift Parrot and Regent Honeyeater.
- Hunter Valley - The Hunter Valley KBA is a 560 km^2 tract of land around Cessnock in central-eastern New South Wales. The site has been identified as a KBA because it regularly supports significant numbers of the Critically Endangered Regent Honeyeater and Swift Parrot. The KBA is defined by remnant patches of eucalypt-woodland and forest used by the birds in a largely anthropogenic landscape. It includes Aberdare and Pelton State

Forests, Broke Common, Singleton Army Base, Pokolbin, Quorrobolong, Abermain and Tomalpin, as well as various patches of bushland, including land owned by mining companies. The KBA contains Werakata National Park and part of Watagans National Park.

- Lake Macquarie – Lake Macquarie is Australia's largest coastal salt water lake. Located in the Hunter Region of New South Wales, it covers an area of 110 km^2 and is connected to the Tasman Sea by a short channel. The remnant and fragmented eucalypt forests on the southern margins of the lake have been identified as a 121 km^2 KBA because they support significant numbers of Critically Endangered Swift Parrots and Regent Honeyeaters in years when the Swamp Mahogany and other trees are flowering.

- Richmond Woodlands – The Richmond Woodlands comprise some 329 km^2 of eucalypt woodland remnants close to Richmond, New South Wales. They lie at the foot of the Blue Mountains on the north-western fringe of the Sydney metropolitan area. The KBA boundary is defined by patches of habitat suitable for Critically Endangered Regent Honeyeaters and Swift Parrots, centred on the woodlands between the Agnes Banks, Windsor Downs and Castlereagh Nature Reserves, and extending south to Penrith and north-east to encompass Scheyville National Park. It is adjacent to the forested hills of the Greater Blue Mountains KBA.

- South-west Slopes of New South Wales - An area of 25,653 km^2, largely coincident with the bioregion, has been identified as a KBA because it supports a significant wintering population of the Critically Endangered Swift Parrots and Vulnerable Superb Parrots (*Polytelis swainsonii*), as well as populations of Painted Honeyeaters and Diamond Firetails. Most of the site is modified wheat-growing and sheep-grazing country with only vestiges of its original vegetation. Remnant patches of woodland and scattered large trees, especially of Mugga Ironbark (*E. sideroxylon*), Apple Box (*E. bridgesiana*), Grey Box (*E. microcarpa*), White Box (*E. albens*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*), Yellow Gum (*E. leucoxylon*), River Red Gum and Blakely's Red Gum (*E. blakelyi*), still provide habitat for the Painted Honeyeaters. Protected areas within the site include several nature reserves and state forests, as well as the Livingstone and Weddin Mountains National Parks, and Tarcutta Hills Reserve.

- Tuggerah - The Tuggerah Lakes, a wetland system of three interconnected coastal lagoons, are located on the Central Coast of New South Wales, Australia and comprise Lake Munmorah, Budgewoi Lake and Tuggerah Lake. The adjacent forests and woodlands provide habitat for Swift Parrots and Regent Honeyeaters in the non-breeding season.

- Ulladulla to Merimbula – The Ulladulla to Merimbula KBA comprises a strip of coastal and subcoastal land stretching along the southern coastline of New South Wales. It is an important site for Swift Parrots. The 2,100 km^2 KBA extends for about 250 km between the towns of Ulladulla and Merimbula and extends about 10 km inland from the coast. It is defined by the presence of forests, or forest remnants, of Spotted Gum and other flowering eucalypts used by Swift Parrots. It includes forests dominated by ironbarks and bloodwoods which are likely to support Swift Parrots in years when the Spotted Gums are not flowering. The KBA either encompasses, or partly overlaps with, the Ben Boyd, Biamanga, Bournda, Clyde River, Eurobodalla, Gulaga, Meroo, Mimosa Rocks, Murramarang and South East Forest National Parks.

Victoria

- Bendigo Box-Ironbark Region – The Bendigo Box-Ironbark Region is a 505 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Bendigo-Maldon region of central Victoria. The site lies between the Maryborough-Dunolly Box-Ironbark Region and Rushworth Box-Ironbark Region KBAs. It includes much of the Greater Bendigo National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as an KBA because, when flowering conditions are suitable it supports up to 50 percent of the global population of non-breeding Swift Parrots.

- Maryborough-Dunolly Box-Ironbark Region - The Maryborough-Dunolly Box-Ironbark Region includes all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Maryborough-Dunolly region of central Victoria. The 900 km^2 KBA includes several nature reserves, state parks and state forests, with only a few small blocks of private land. It excludes adjacent areas of woodland that are less suitable for Swift Parrots.

- Puckapunyal – Puckapunyal Military Area (PMA) is an Australian Army training facility and base 10 km west of Seymour, in central Victoria. The PMA contains box-ironbark forest that forms one of the largest discrete remnants of this threatened ecosystem in Victoria. The entire PMA, along with two small reserves and an army munitions storage site at nearby Mangalore, has been identified as a 435 km^2 KBA because it supports the largest known population of Bush Stone-curlews in Victoria. It is also regularly visited by Critically Endangered Swift Parrots, often in large numbers.

- Rushworth Box-Ironbark Region - The Rushworth Box-Ironbark Region is a 510 km^2 fragmented and irregularly shaped tract of land that encompasses all the box–ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the Rushworth-Heathcote region of central Victoria. It lies north of, and partly adjacent to, the Puckapunyal KBA. The site includes the Heathcote-Graytown National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for the Swift Parrot. The region was identified as an KBA because, when the flowering conditions are suitable it supports up to about 70 Swift Parrots.

- St Arnaud Box-Ironbark Region - The St Arnaud Box-Ironbark Region is a 481 km^2 fragmented and irregularly shaped tract of land that encompasses all the box-ironbark forest and woodland remnants used as winter feeding habitat by Swift Parrots in the St Arnaud-Stawell region of central Victoria. The site lies west of the Maryborough-Dunolly Box-Ironbark Region KBA. It includes the St Arnaud Range National Park, several nature reserves and state forests, with a few small blocks of private land. It excludes other areas of woodland that are less suitable for Swift Parrots. The region was identified as a KBA because, when flowering conditions are suitable it supports up to about 75 Swift Parrots.

- Warby-Chiltern Box-Ironbark Region - The Warby–Chiltern Box–Ironbark Region comprises a cluster of separate blocks of remnant box-ironbark forest habitat, with a collective area of 253 km^2, in north eastern Victoria. This site lies to the east of the Rushworth Box-Ironbark

Region KBA. It includes the Reef Hills and Warby-Ovens National Parks, Killawarra Forest, Chesney Hills, Mount Meg Reserves, Winton Wetlands Reserve, the Boweya Flora and Fauna Reserve, Rutherglen Conservation Reserve, Mount Lady Franklin Reserve and Chiltern-Mount Pilot National Park. Most of it lies within protected areas or state forests, encompassing only small blocks of private land. The site has been identified as an KBA because it provides feeding habitat for relatively large numbers of non-breeding Swift Parrots when flowering conditions are suitable, as well as the Critically Endangered Regent Honeyeaters.

Tasmania

- Bruny Island – Bruny Island is a 362 km^2 island located off the south-eastern coast of Tasmania. Bruny Island is classified as a KBA because it supports the largest population of the Endangered Forty-spotted Pardalote, up to a third of the population of the Swift Parrot.
- Maria Island - Maria Island is a mountainous island located in the Tasman Sea, off the east coast of Tasmania. The 115 km^2 island is contained within the Maria Island National Park, which includes a marine area of 18 km^2 off the island's northwest coast. Maria Island has been identified as a KBA because it supports significant numbers of Swift Parrots and Endangered Forty-spotted Pardalotes.
- South-east Tasmania - The South-east Tasmania KBA encompasses much of the land retaining forest and woodland habitats, suitable for breeding Swift Parrots and Forty-spotted Pardalotes, from Orford to Recherche Bay in south-eastern Tasmania. This large 335,777-hectare KBA comprises wet and dry eucalypt forests containing old growth Tasmanian Blue Gums or Black Gums, and grassy Manna Gum woodlands, as well as suburban residential centres and farmland where they retain large flowering, and adjacent hollow-bearing, trees. Key tracts of forest within the KBA include Wielangta, the Meehan and Wellington Ranges, and the Tasman Peninsula. The area has been identified as a KBA because it contains almost all the breeding habitat of the Swift Parrot on the Tasmanian mainland.

2.8 Habitat critical for survival

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

Habitat critical to the survival for the Swift Parrot includes:

Breeding habitat in Tasmania

- All native forest and woodland containing Blue Gum (*E. globulus*) and/or Black Gum (*E. ovata*) as a dominant, subdominant or low density species within the known breeding areas. Known breeding areas are areas containing known nest records and areas deemed as important for breeding by species specialists.
- All known nest trees, as well as forest and woodland containing potential nesting trees within the known breeding areas. Potential nesting trees typically contain hollows, have a large trunk diameter at breast height, and have signs of senescence (i.e. contain dead wood).

Foraging habitat on the Australian mainland

- All preferred foraging species within known and likely foraging habitat on the mainland including Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*) having a diameter at breast height of 60 cm or greater.

Habitat for the long-term maintenance of the species

- Suitable habitat within all Key Biodiversity Areas with Swift Parrot as a Trigger species.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, publicly owned forests and state reserves, and national parks. It is essential that the protection is provided to these areas and that enhancement and protection measures target these productive sites. Whenever possible, habitat critical to the survival of the Swift Parrot should not be destroyed.

When considering habitat loss, alteration or significant impacts to habitat in any part of the Swift Parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species remain an important tool in refining understanding of the area's relative importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. As a result, the absence of Swift Parrots from a give location at a given time cannot be taken as evidence that that location is unsuitable habitat. Rather, if there are potential food plants present (that include resources such as lerps, not just flowers) then that site may be utilised by Swift Parrots if conditions become favourable. This opportunistic habitat use means survey data and historical records need to be considered when assessing the relative importance of a local area or region for Swift Parrots, in addition to the knowledge that variation in local conditions is a crucial predictor of Swift Parrot presence/absence and site utilisation (Webb et al. 2019).

THREATS

3.1 Historical causes of decline

Commented [A6]: Focussing on habitat, as usually the case for Recovery Plans, is less appropriate here as the main threat (predation by sugar gliders) is not driven by habitat availability or conditions. Habitat free of sugar gliders is more important than identical habitat with sugar gliders present. The Recovery Plan therefore needs to be worded so as to avoid the impression that protection of critical habitat is the most important action.

The Swift Parrot's area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83 percent of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70 percent has been cleared in New South Wales (Siversten 1993; Robinson and Traill 1996; Environment Conservation Council 2001). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4 percent of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70 percent of grassy Tasmanian Blue Gum forest (Saunders and Tzaros 2011), and over 90 percent of Black Gum forest (Department of Environment and Energy 2018) has been cleared.

3.2 Current threatening processes

The main threats in Tasmania to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat through forestry operations, land clearing and wildfire. This is compounded by predation of nestlings and incubating females by the introduced Sugar Glider, which is worst in areas of severe deforestation (Stojanovic et al. 2014). The main threats on the Australian mainland include habitat loss from land clearing, forestry, agriculture and urban development. Other identified threats include competition for foraging and nesting resources, mortality from collisions with human-made objects and impacts from climate change. Preventing, reducing and managing threats is the primary focus of this recovery plan.

To ensure the conservation of Swift Parrots there is an urgent need to protect existing breeding and foraging habitat across a diversity of tenure in south-eastern Australia; to reduce the impact of Sugar Glider predation; to better understand and manage all trophic levels of climate change impacts and to substantially increase habitat restoration efforts throughout the species' range (Saunders and Russell 2016). Without strong direct action at all levels, from local landholders through to state and national government agencies responsible for managing this species and its habitat, the future of this species is not secure (Saunders and Russell 2016).

3.2.1 Habitat loss and alteration

Forestry and land clearing

Ongoing habitat loss in Tasmania through land clearing, native forest logging and intensive native forest silviculture practices poses the greatest threat to survival of the Swift Parrot population (Webb et al. 2017; Webb et al. 2019). Forestry operations and conversion of native forest to tree plantations over the past 30 years has reduced the amount of available Swift Parrot nesting and foraging habitat (Saunders et al. 2007, Saunders and Tzaros 2011, Webb et al. 2017). Recent estimates of forest harvesting in the Southern Forests Swift Parrot Important Breeding Area in Tasmania shows that between 1997 and 2016, approximately 33 percent of all native eucalypt forest was converted to plantation or lost to clear-fell native forest logging, and 23 percent of the identified nesting habitat (i.e. old growth trees) which contained critical nest hollow resources for the species, was lost (Webb et al. 2019). As nesting hollows generally only occur in old trees and larger trees have proportionally more nectar and food resources, the ongoing harvesting of breeding and foraging habitat in native forests remains the most significant threat to the species' persistence in the wild.

Commented [A7]: Factually incorrect. This is simply not the case, and contradicts text in the Recovery Plan above (e.g. p.7, pp.9-10) as well as the formal Population Viability Analysis of Heinsohn et al (2015). Predation by sugar gliders is the main threat to the survival of Swift Parrot, and its recognition was sufficient to trigger relisting of the species as Critically Endangered.

Commented [A8]: Incorrect. Predation may be compounded by forestry operations (although the modelled relationship is weak), not the other way around.

Commented [A9]: Agriculture per se is not a threat. Land clearing for agriculture is.

Commented [A10]: As the main threat, put first.

Commented [A11]: This needs to be separated into two sections, (i) forestry and (ii) land clearing. Forest harvesting does not involve land clearing, loss of forest, or deforestation. Overall, discussion needs to be about habitat quality, which is more subtle and much less emotive – but is the parameter to which the species actually responds. Forest harvesting needs to occur under management prescriptions that maintain habitat quality

Commented [A12]: Again, not the case – see above. Focussing on this particular claim will lead to misplaced actions that maintain the major threat to the species.

Commented [A13]: Historical data, but the description of these figures is also disputed. Native forest is not 'lost' to clearfelling.

Commented [A14]: No, historical not ongoing. Reference is needed to recent developments ongoing post-PAMA/Threatened Fauna Adviser

A significant area of the Swift Parrot breeding habitat is subject to management arrangements under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is intended to be consistent with the requirements for threatened species protection and recovery under the EPBC Act, and forestry operations undertaken in accordance with the RFA do not need additional approvals under Part 3 of the EPBC Act. RFAs do not exempt forestry operations from obligations in state-based legislation for the protection of threatened species and communities. Under the *Tasmanian Forest Practices Act 1986*, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA 2014) for the management of threatened species in production forests, and is intended to provide a stream-lined management process for threatened species in the context of wood production (FPA 2014).

Management arrangements have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al. 2004) which were erroneously considered a priority for the species, based on information existing at the time. In 2007 it was recognised that wet forests are just as crucial component of the breeding habitat for Swift Parrots (Webb 2008; Webb et al. 2014, 2017, 2019). The current measures for the management of Swift Parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority 2014). Since Swift Parrot breeding habitat is poorly reserved in the National Reserve Network in Tasmania, there is considerable reliance on the protection measures delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting and foraging habitat availability and management approaches in off-reserve areas is urgently required to refine and ensure the effectiveness of these measures. Currently, there are no measures addressing habitat recruitment. The RFA has failed to adequately protect Swift Parrots in their breeding range because large areas of potential or known habitat have been logged, despite potential impacts on the species (Webb et al 2019).

Harvesting operations and land clearing of foraging habitat on the Australian mainland also remains a substantial threat. Impacts on Swift Parrot habitat in NSW have been so severe that only 5 - 30 percent of the original vegetation now remains, such as for Grey Box and Grassy White Box woodland, and what is left is often degraded (Saunders and Russell 2016). With such extensive losses of habitat there is an increased risk that the remaining areas fail to produce the necessary food resources in one year. Before such extensive habitat losses occurred, the birds had a much greater chance of locating the food resources they needed each year (Saunders and Russell 2016).

The harvesting of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales, including Spotted Gum forests on the south coast, for forestry reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots. Larger trees typically provide more reliable, greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005). However, the extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified, and the impacts from urban land clearing and commercial harvesting operations on the mainland remain uncertain.

Firewood collection – illegal and legal

Commented [A15]: And Supplementary RFA (TCFA: 2005) and as amended (2017?)

Commented [A16R15]:

Commented [A17]: Better "provides an alternative mechanism for delivery of the requirements for". "Intended" suggests that the author believes consistency is not attained but is not willing to say this

Commented [A18]: Correct, but important to add that RFAs accredit state-based forest practices systems – else logic is unclear

Commented [A19]: Second, need specific reference to both the 2020 PAMA, and to the advice contained in the Threatened Fauna Adviser

Commented [A20]: Again, uncritical quoting of Webb et al is not helpful. Undoubtedly historical forest harvesting has impacted Swift Parrot breeding habitat, but that is not the main threat to the species. Secondly, following the author's logic in the previous paragraph, the phrasing here should be that the Tasmanian Forest Practices System has not protected all the breeding habitat for the species, increasing the threats..

Commented [A21]: "The harvesting … for forestry"? Meaning? Suggest delete "for forestry".

Commented [A22]: Urban and agricultural

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often those most valuable to the Swift Parrot, being large, mature forage trees or trees with suitable nesting hollows. Registered firewood suppliers operate in accordance with industry codes of practice or are formally regulated, which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood in Tasmania, and these collectors are impacting on Swift Parrot habitat. In some areas the local impacts of illegal firewood harvesting can be severe. For example, approximately one third of known nest trees have been illegally felled for firewood at one breeding site (Stojanovic, D., unpublished data).

Fire

Increases in fire frequency, intensity and scale pose a significant threat to avian communities. Where fire intervals are too short, flowering events and maturation of nectar-rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fires will incrementally impact on Swift Parrot values across its range.

Fires may kill canopy trees but these (and hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburnt trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al. 2015). Further, hollow loss in the aftermath of fire may act to limit the short term abundance of nest sites in burned habitats. Stojanovic et al (2015) showed that of 63 per cent of known nest hollows that were burnt in a wildfire collapsed, reducing the availability of nests in an important breeding site.

Recent fires in Tasmania have destroyed and/or negatively impacted large areas of remaining breeding habitat. While difficult to accurately quantify the combined impact has been immense relative to the area of remaining breeding habitat and replacement time. In 2019-20, following years of drought (DPI 2020), catastrophic wildfire conditions culminated in fires that covered an unusually large area of eastern and southern Australia. The bushfires will not have impacted all areas equally: some areas burnt at very high intensity whilst other areas burnt at lower intensity, potentially even leaving patches unburnt within the fire footprint. However, an initial analysis estimates that between 10 - 30 percent of the distribution range of the Swift Parrot was impacted to some degree. This type of event is increasingly likely to reoccur as a result of climate change.

Residential and industrial development

Urban, rural residential and industrial developments can pose a threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into box-ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from tree removal associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence, dieback, over grazing and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, Victoria and throughout New South Wales.

3.2.2 Predation by Sugar Gliders

Commented [A23]: Is most significant threat so put first

Predation on the nest by Sugar Gliders on the mainland of Tasmania is a significant threat to the species, which interacts synergistically with deforestation (Stojanovic et al 2014). Sugar Gliders eat Swift Parrot eggs, nestlings and females, and impose a severe, sex-biased demographic pressure on the population (Stojanovic et al. 2014; Heinsohn et al. 2015, Heinsohn et al. 2019). Stojanovic et al. (2014) showed that modelled survival of Swift Parrot nests was a function of modelled mature forest cover in the surrounding landscape and the likelihood of Sugar Glider predation was modelled to decreased with increasing forest cover.

Commented [A24]: Forest cover is at most a minor influence, even if the modelled relationship is correct, so do not use it to distract from major threat – predation.

While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018). Maria and Bruny Islands are free of Sugar Gliders and it is important to remain vigilant to possible incursions. Maintaining the Sugar Glider-free status of these two islands is critical for the conservation of Swift Parrots in Tasmania.

Control of the impacts of Sugar Gliders on Swift Parrots has proven very challenging. Although automated doors fitted to nest boxes are effective at protecting individual nests from predation (Stojanovic et al. 2019), there remains major uncertainty about how to protect nests in tree hollows. An attempt to use fear-based approaches to reduce predation impacts was ineffective (Owens et al. 2020). Early attempts to control Sugar Gliders by culling them have proven unsuccessful to date (Stojanovic et al. *in review*) although further efforts are underway to evaluate different techniques. Nevertheless, the weight of evidence suggests that if controlling Sugar Glider predation on Swift Parrots is possible, deploying these approaches at large enough scales to benefit the population as a whole is an ambitious aspiration. This challenge is made harder because Sugar Gliders are

widespread in Swift Parrot nesting habitat (Allen et al. 2018) and tolerate landscapes with a high degree of forest disturbance.

3.2.3 Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008; Hingston 2019) in Tasmania and mainland eastern Australia. Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas.

The construction of wind energy turbines and associated energy infrastructure (i.e. powerlines) in south-eastern Australia may also have implications for the conservation of the Swift Parrot where infrastructure is poorly situated (Barrios and Rodriguez 2004). Parrots may be killed through collision, or their behaviour may be modified by the presence of these structures leading to avoidance of suitable habitat. The potential impacts of these structures may be greatest where they are situated along migration routes where a large proportion of the population may be exposed to the threat. Wind turbines and associated energy infrastructure are located, and continue to be built, along the migratory route and within the non-breeding range. This ongoing development increases the likelihood of the birds' being exposed to collision mortality or loss of habitat.

3.2.4 Competition

Swift Parrots can experience increased competition for resources from the aggressive Noisy Miners (*Manorina melanocephala*) and introduced Rainbow Lorikeets (*Trichoglossus haematodus*) within altered habitats (Ford et al. 1993; Grey et al. 1998; Hingston 2019), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al. 2004; Heinsohn et al. 2015; Hingston and Wotherspoon 2017; Hingston 2019). Swift Parrots compete with European Honeybees (*Apis mellifera*) and Starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al. 2015). This competition is most prevalent in forest that is disturbed or fragmented (Stojanovic, D. unpublished data), or impacted by climate change.

3.2.5 Climate variability and change

Drought is a natural part of Australia's climate and the present-day existence of the Swift Parrot demonstrates that the species is well-adapted to cope with a dry climate. However, the relatively recent and rapid decrease in available habitat, coupled with prolonged or more frequent drought periods, could increase threats on an already depleted population.

Climate projections for eastern Australia include reduced rainfall, increased average temperatures, and more frequent droughts and fires (CSIRO 2007; CSIRO and Bureau of Meteorology 2015). Climate change impacts are compounded by the Swift Parrot's restricted area of occupancy, low (and decreasing) population, low population density at sites and short generation length (under 10 years). These variables are identified as increasing the risk of local extinction (Pearson et al. 2014)

and are amongst the strongest predictor of species' vulnerability to climate change (Pearson et al. 2014).

Loss of nesting and foraging habitat from climate change and changes in seasonality and the geographic pattern of flowering is likely to pose a significant threat to the Swift Parrot (Porfirio et al. 2016). Direct impacts to the Swift Parrot as a result of climate change include cases of climate-related nest failures, altered rainfall patterns, flowering failures on the mainland, and extreme wildfires.

Climate change management requires both domestic and international action to stop further emission of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species and habitats may be needed to understand the sensitivities of the Swift Parrot to climate change and to form the basis for future adaptive conservation management strategies. Further, the cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

3.2.6 Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act (Department of Environment and Heritage 2005b). The Swift Parrot may be susceptible to illegal wildlife capture and trading activities.

3.2.7 Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. In addition, impacts from a single threat increase the overall risk of extinction, such as repeated small-scale clearing for developments that do not meet significant impact thresholds, but whose total impact over time contributes to the species decline.

POPULATIONS UNDER PARTICULAR PRESSURE

Genetic analysis confirms that Swift Parrots form a single, genetically mixed (panmictic), breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

RECOVERY PLAN VISION, OBJECTIVE AND STRATEGIES

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

Recovery Plan Objectives

By 2031, measure and sustain a positive population trend.

By 2031, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot.

This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats including protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness.

Strategies to achieve objectives

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales.
3. Reduce impacts from Sugar Gliders at Swift Parrot breeding sites.
4. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures.
5. Monitor and manage other sources of mortality.
6. Engage community and stakeholders in Swift Parrot conservation.
7. Coordinate, review and report on recovery progress.

ACTIONS TO ACHIEVE SPECIFIC OBJECTIVES

Actions identified for the recovery of Swift Parrot are described below. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to Swift Parrot and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of Swift Parrot.
Priority 3:	Action is desirable, but not critical to the recovery of Swift Parrot or assessment of trends in that recovery.

***Strategy 1**: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
1.1	Design and implement a long-term monitoring program for Swift Parrot	1	• A standardised survey technique has been developed that is suitable across the species' range • Monitoring has incorporated information on habitat use • Monitoring has occurred annually at key locations and at a minimum of every two years at other locations, using a standardised surveying protocol and survey effort	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$150,000 pa
1.2	Analyse survey data to assess national population size and trends	1	• Knowledge on the population size and trends has increased • Population trends have been assessed annually for key locations and, where possible, other locations as data becomes available	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
1.3	Use genetic techniques to understand population genetics and demographic processes in the context of Swift Parrot declines	1	• Genetic techniques have been used to increase knowledge of Swift Parrot population and demographic processes • New knowledge has been used to inform future management interventions	**Academic institutions**	$140,000
1.4	Maintain a free and openly available database for	2	• A free and openly available central repository for reporting monitoring	**Recovery Team**	$50,000 pa

	population, habitat and distributional data		observations has been identified • Relevant government databases have been maintained and updated on a regular basis • Databases have been integrated to capture national population, habitat and distributional information for the species • Information has been shared with relevant stakeholders in a timely manner to support management interventions	**State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	
1.5	Undertake a Population Viability Analysis	2	• Where data exists, a Population Viability Analysis has been undertaken and results have been used to inform management actions and priorities	**Recovery Team** **State governments** **Research agencies** NGOs Academic institutions BirdLife Australia	$75,000
1.6	Assess the need to establish a captive Swift Parrot population to guard against extinction in the wild and to allow for reintroductions to occur	2	• Undertake a formal structured decision making process using a range of experts to identify triggers for the establishment of a captive insurance population • A Swift Parrot Captive Management Plan has been developed • If required, establish a captive insurance population	**Recovery Team** **Australian Government** **State governments** NGOs Academic institutions BirdLife Australia	$75,000

Commented [A25]: Already done – see Heinsohn et al (2015). Not obvious that there is sufficient new data to merit repeating.

***Strategy 2**: Protect known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
2.1	Identify known breeding and foraging habitat for Swift Parrot	1	• Existing and new information has been reviewed and used to identify important breeding and foraging habitat that requires management intervention • Important habitat has been prioritised to determine which sites require increased protection based on its importance and the risks to its persistence • Important habitat has been accurately mapped and is available to all relevant stakeholders and land managers • New knowledge has been incorporated into relevant policy documents to support management interventions • Key Biodiversity Areas have been reviewed and updated as new information becomes available	**Australian Government** **State governments** **Recovery Team** **Research agencies** NGOs Academic institutions BirdLife Australia	$125,000 pa
2.2	Secure Tasmanian and Commonwealth Government commitment to support strategic planning for Swift Parrot breeding habitat	1	• The completion of the Public Authority Management Agreement (PAMA, under the TSPAct 1995) has occurred between DPIPWE and Sustainable Timber Tasmania for the Permanent Timber Production Zone land in the Southern Forests • Annual monitoring has occurred and an ongoing review of the implementation and effectiveness of the current management	**Australian Government** **Tasmanian Government** **Sustainable Timbers Tasmania**	Core government business

Commented [A26]: Completed, so delete from here. Rewrite actions now that PAMA is in place

			recommendations has been undertaken • Recommendations from the ongoing review have been considered and implemented • An agreed strategic management plan for forestry activities in Tasmania that is consistent with the objective of achieving a sustained increase in the Swift Parrot population between 2021-2031 has been completed and implemented		
2.3	Review and revise as appropriate Swift Parrot management priorities, recommendations, planning tools and procedures as new information becomes available	2	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range	**Australian Government** **State governments** **Local government**	Core government business
2.4	Protect areas of 'habitat critical to survival' not managed under an RFA agreement from developments (e.g., from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms	1	• Developments have avoided areas of 'habitat critical to survival' for the Swift Parrot where possible • Where avoidance is not possible, the extent and severity of clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been measurably minimised and offset • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures • If avoidance or mitigation has been found to be impossible, any developments that proceeded in areas of 'habitat critical to survival' have provided offsets compliant with the approved offset	**Australian Government** **State governments** **Local government**	Core government business

			regulations and calculators and provided measurable benefits to the Swift Parrot population in line with strategies outlined in this recovery plan		
2.5	Enhance the quality and extent of existing breeding habitat in Tasmania through strategic plantings	2	• Manage regenerating and regrowth Blue Gum and Black Gum forest to provide foraging habitat into the future • Encourage large-scale plantings of Blue Gum and Black Gum forest and woodland by landholders and land managers in priority areas through a strategic landscape approach	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa
2.6	Regulate firewood collecting in breeding, foraging and non-breeding habitat	2	• Quantify the extent of firewood harvesting in breeding, foraging and non-breeding habitat	**State governments** **Local government**	$75,000 pa

			• Compliance and enforcement activities have been targeted at reducing illegal firewood harvesters • A voluntary code of practice for the firewood industry (including a certification system) has been developed and introduced to enable adequate knowledge of and regulation of impacts on Swift Parrot habitat	**NRM regional bodies** **Private landholders**	
2.7	Develop agreements with local government and government agencies that aim to maintain and enhance Swift Parrot breeding habitat	2	• Management agreements have been developed with local government and state government agencies which maintain and enhance Swift Parrot breeding habitat • Reporting mechanisms have been developed to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat	**State governments** **Local government** **NRM regional bodies** Private landholders	$150,000 pa
2.8	Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate	1	• Management plans for important winter foraging habitat/sites have been developed and implemented • Management plans have been adequately resourced • Consideration has been given to enhance formal protection for sites where appropriate (i.e., through new conservation reserves, national parks etc)	**State governments** **Local government** **NRM regional bodies** Private landholders	$350,000 pa
2.9	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots have been identified • Remnants have been ranked for their conservation significance and mapped • Consideration has been given to enhance formal protection	**Australian Government** **State governments** **Local government** **NRM regional bodies**	$150,000 pa

			for sites where appropriate (i.e., through new conservation reserves, national parks etc) • Local management plans have been developed for priority remnants to maximise conservation values of the identified sites	Private landholders BirdLife Australia NGOs	
2.10	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed • Identified sites protected through covenanting and other private land conservation programs	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000 pa

***Strategy 3**: Reduce impacts from Sugar Gliders at Swift Parrot breeding sites*

Commented [A27]: Should be Strategy 1

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
3.1	Determine Sugar Glider density across Swift Parrot breeding areas and devise a management strategy for Sugar Gliders	1	• Knowledge of Sugar Glider densities in Swift Parrot breeding areas has improved • Sugar Glider density across Swift Parrot breeding areas has been mapped • A management strategy has been developed to manage Sugar Glider population at important sites, such as breeding areas regularly used by Swift Parrots • The strategy includes actions that address increased use of nest protection methods and/or programs that reduce Sugar Glider numbers	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials have been undertaken in key Swift Parrot breeding areas • A range of different exclusion methods have been assessed for their effectiveness • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$100,000 pa
3.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials have been undertaken to test the impacts of predator playbacks on Sugar Glider density, Swift Parrot mortality and breeding success • Trials have been undertaken to test the impacts of directly reducing Sugar Glider	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$50,000 pa

			density (through trapping and euthanising) on Swift Parrot mortality and breeding success • New knowledge has been incorporated into management interventions	Academic institutions	
3.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• An improved understanding can be demonstrated of the re-colonisation dynamics of Sugar Gliders resulting from local management interventions and population reductions • An improved understanding can be demonstrated of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$50,000
3.5	Further investigate the possible link between forest condition, Sugar Glider density and Swift Parrot predation rates	1	• An improved understanding can be demonstrated of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success • New knowledge has been incorporated into management interventions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$125,000 pa
3.6	Develop communication strategy specific to Sugar Glider management	1	• A targeted communications strategy has been developed that communicates why Sugar Glider numbers need to be controlled within Swift Parrot breeding areas • Communication outputs have included but not limited to, social media networks, pamphlets and community presentations	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs Academic institutions	$30,000
3.7	Ensure mechanisms are in place for the early detection, and control, of Sugar Gliders introduced to	1	• A process has been developed and implemented to ensure the early detection of Sugar Gliders on islands where Swift Parrots breed	**Tasmanian Government** **NRM regional bodies**	$75,000 pa

	Maria and Bruny Islands		but which are currently Sugar Glider free • A management plan and control program that addresses the prevention of Sugar Glider invasion and spread and management of impacts across Tasmania s developed and approved by 2021 • The management plan has included rapid response protocols to eliminate Sugar Gliders on Maria and Bruny Islands	**Research agencies** NGOs Academic institutions	
3.8	Undertake regulatory reform of Sugar Glider protected wildlife status	1	• Sugar Gliders have been removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010 • The Tasmanian Government has given consideration to declaring Sugar Gliders as vermin under the *Vermin Control Act 2000* (Tas) or as an invasive species under subsequent Tasmanian legislation should the *Vermin Control Act* be replaced	**Tasmanian Government**	Core government business

***Strategy 4**: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures*

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
4.1	Undertake fine-scale mapping of breeding, foraging and non-breeding habitat to inform adaptive management	1	• Fine-scale mapping of breeding areas has been undertaken for each breeding season over the life of this recovery plan • Nest tree locations have been identified, mapped and entered into database to assist with fine-scale management	**State governments** **Local government** **NRM regional bodies** **Research agencies**	$125,000 pa

			• Fine-scale mapping of non-breeding habitat areas have been undertaken • All fine-scale mapping has been made available to land managers and the public • New knowledge has been incorporated into management interventions	NGOs Academic institutions	
4.2	Obtain a greater understanding of local, regional and landscape use and habitat bottlenecks, including migratory pathways	2	• Important winter foraging sites have been identified and documented annually • Important breeding sites have been identified and documented annually • New knowledge of broad-scale movement patterns across the landscape have been generated • New knowledge of migratory pathways have been generated • Data collected have been used to analyse habitat use and factors that may influence site occupancy, such as (but not limited to) eucalypt flowering patterns, patterns of availability in all food resources (i.e. including lerp) and climate variability • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$150,000 pa
4.3	Continue research on breeding success, survival and mortality through nest monitoring and targeted studies	2	• Existing knowledge of breeding success, survival and mortality has expanded • New knowledge has been incorporated into management interventions • Research has demonstrated the effectiveness of recovery plan actions	**Tasmanian Government** **NRM regional bodies** **Research agencies** NGOs	$140,000 pa

				Academic institutions	
4.4	Use monitoring and modelling techniques and monitoring to investigate the potential influence of climate change on eucalypt flowering and other food resources (including lerps) to identify potential refuge for the Swift Parrot over the next 100 years	2	• Modelling has been undertaken to identify key areas of existing habitat that will become climate refuge for the Swift Parrot over the next 100 years • Consideration has been given to enhance the National Reserve Network for appropriate sites (i.e., through new conservation reserves, national parks etc) • A monitoring program has been established to investigate the relationship between climate variables and the availability of food resources for the Swift Parrot	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$250,000

***Strategy 5**: Monitor and manage other sources of mortality*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised	2	• Existing collision impact guidelines have been updated as required and made accessible to relevant stakeholders • There has been a demonstrated decrease in the number of collisions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$50,000
5.2	Conduct a national sensitivity analysis on the potential impact of terrestrial and offshore windfarm installations	2	• A comprehensive national sensitivity analysis has been published identifying the risks of collision and displacement of Swift Parrots • New information has been used to update state and local planning guidelines	**Research agencies** NGOs Academic institutions	$125,000
5.3	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population	3	• The incidence of disease has been recorded during handling and monitoring of Swift Parrots • A management strategy has been developed if incidence of disease is noted to be increasing	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders**	$50,000

				BirdLife Australia NGOs	
5.4	Encourage appropriate building design and tree plantings in urban areas to manage risks to foraging Swift Parrots, and hence reduce collision mortality	3	• Guidelines have been developed and disseminated to land managers to encourage appropriate building design and tree plantings in urban areas	**State governments** **Local government** **NRM regional bodies**	$50,000
5.5	Investigate the potential impacts of bees, starling and Rainbow lorikeets on the availability of nesting resources	3	• An improved understanding of hollow use and competition can be demonstrated • New knowledge has been incorporated into management interventions	**State governments** **Local government** **NRM regional bodies** Academic institutions	$50,000

***Strategy 6**: Engage community and stakeholders in Swift Parrot conservation*

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*	Indicative Cost
6.1	Continue to raise awareness and educate the general public about Swift Parrot conservation	1	• A strategic communications and engagement program has been prepared and implemented outlining the conservation needs of Swift Parrots and their habitat • Articles about Swift Parrot conservation are published in newsletters, local bulletins, and online • Informative displays have been developed to educate the community about the conservation needs of Swift Parrot and their habitat	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.2	Actively encourage the general public to participate in 'citizen science' activities where appropriate	2	• A network of volunteers has been maintained to help assist with local and regional surveys • Where appropriate, opportunities have been provided for citizen scientists to participate in research projects related to recovery actions	**Australian Government** **State governments** **Local government** **NRM regional bodies** **Private landholders** BirdLife Australia NGOs	$30,000 pa
6.3	Engage Indigenous landholders where appropriate to undertake recovery plan related activities	2	• Targeted consultation has been undertaken with Indigenous landholders to identify ways to increase	**All**	$30,000 pa

			engagement in recovery plan actions • Where appropriate, Indigenous groups have been engaged in implementation activities		
6.4	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material has been developed and/or updated that targets land managers • Material has been disseminated to state and local governments, consultants and resource managers	**All**	$30,000 pa

Strategy 7: Coordinate, review and report on recovery progress

Action		**Priority**	**Performance Criteria**	**Responsible Agencies** *and potential partners*	**Indicative Cost**
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• The Recovery Team continues to operate under agreed Terms of Reference • Membership of the Recovery Team is reviewed to ensure it comprises representatives with technical expertise relevant to recovery actions, and management responsibility at the jurisdictional level • The Recovery Team has coordinated, reviewed and reported on the recovery outcomes for the life of this plan	**All**	$30,000 pa
7.2	Approve Recovery Team governance arrangements	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practise guidelines	**Recovery Team**	Core government business

			• The Recovery Team has been registered nationally		
7.3	Submit annual reports on progress against recovery actions	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework	**Recovery Team**	Core government business
7.4	Review the recovery plan five years after making	1	• In consultation with relevant stakeholders, a five review of the recovery plan has been endorsed by the Recovery Team • The conservation status of Swift Parrot has been reviewed every 5 years in conjunction with the recovery plan review	**Recovery Team**	$10,000
7.5	Facilitate knowledge exchange and awareness between relevant threatened species land managers, researchers and decision makers	1	• A communication network between interested stakeholders has been established • Meetings between site managers has occurred at least biennially to share knowledge and experience	**Recovery Team**	$30,000
7.6	Secure ongoing commitment to provision of funding and resources adequate to coordinate recovery, achieve actions and objectives throughout the life of the plan	1	• All relevant stakeholders involved in the conservation of Swift Parrots have allocated adequate resources to implement actions in the recovery plan	**All**	Core government business

DURATION AND COST OF THE RECOVERY PROCESS

It is anticipated that the recovery process will not be achieved prior to the scheduled five-year review of the recovery plan. The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that Commonwealth and state agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species. The indicative cost of recovery plans actions was derived from expert elicitation and public comments received in 2019 and 2020.

Table 2: Summary of recovery actions and estimated costs in for the first five years of implementation (these estimated costs do not take into account inflation over time).

Action	**Cost (as of 2020)**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Strategy 1	$200,000	$200,000	$200,000	$200,000	$350,000	$1,150,000
Strategy 2	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$1,350,000	$6,750,000
Strategy 3	$455,000	$425,000	$475,000	$425,000	$425,000	$2,205,000
Strategy 4	$475,000	$475,000	$725,000	$475,000	$475,000	$2,625,000
Strategy 5	$50,000	$125,000	$50,000	$50,000	$50,000	$325,000
Strategy 6	$120,000	$120,000	$120,000	$120,000	$120,000	$600,000
Strategy 7	$30,000	$60,000	$30,000	$30,000	$40,000	$190,000
TOTAL	$2,680,000	$2,755,000	$2,950,000	$2,650,000	$2,810,000	$13,845,000

EFFECTS ON OTHER NATIVE SPECIES AND BIODIVERSITY

The Swift Parrot has become a 'flagship' species for biodiversity conservation across eastern Australia, particularly in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species and hollow-dependant animals in general. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*) and the Superb Parrot (*Polytelis swainsonii*). Many other mammals, invertebrates and plants will also benefit due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot include: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

SOCIAL AND ECONOMIC CONSIDERATIONS

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding, to secure or rehabilitate habitat, or for other threat mitigation work.

Restrictions on further clearing of Swift Parrot habitat may impact some landowners, managers and developers. These restrictions may not significantly impact agricultural industries since many of the more fertile areas have already been cleared and the remaining forest communities are generally located on less fertile soils and are, therefore, relatively less attractive for grazing or cropping.

Application of prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot will reduce the volume of timber available for harvesting. Sustainable forest management is provided for through the Regional Forest Agreements, which are long-term bilateral agreements between the Commonwealth and the relevant state government. Constitutional responsibility for forest management lies with the state governments, who develop and administer the forest management prescriptions.

A large network of community volunteers across eastern Australia actively participate in annual surveys for Swift Parrots coordinated by BirdLife Australia. Involvement can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their

surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where Swift Parrots are reliably seen. Such areas are more likely to be in Tasmania, particularly in the south east, and popular to visitors during the summer breeding season of the Swift Parrot. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

AFFECTED INTERESTS

Organisations likely to be both positively and negatively affected by the actions proposed in this plan include Australian and state government agencies, particularly those with environmental, agricultural and land planning concerns; industry; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

CONSULTATION

The *National Recovery Plan for the Swift Parrot* has been developed through extensive consultation with a broad range of stakeholders. The consultation process brought together key species experts and conservation managers to categorize ongoing threats to the Swift Parrot, and identify knowledge gaps and potential management options. Consultation included representatives from government agencies, non-government organisations, researchers and local community groups. During the drafting process the Department of Agriculture, Water and the Environment (Cwlth) continued to work closely with key stakeholders.

Notice of the draft plan was made available for public comment between 4 March 2019 and 7 June 2019. Any comments received that were relevant to the recovery of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

EVALUATING THE PERFORMANCE OF THE PLAN

This plan should be reviewed no later than five years from when it was endorsed and the review should be made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a recovery plan is no longer necessary for the species as either a conservation advice will suffice, or the species can be removed from the threatened species list.

As part of this review, the listing status of the species will be re-assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department Agriculture, Water and the Environment in association with relevant Australian and state government agencies, the national Swift Parrot Recovery Team and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of Agriculture, Water and the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment and Water
Tasmania – Department of Primary Industries, Parks, Water and Environment
Australian Capital Territory – ACT Parks Conservation and Lands
Natural Resource Management bodies
Local government bodies

Non-government organisations
BirdLife Australia
Local conservation groups
Local communities
Private landholders
Indigenous communities
Industry
Universities and other research organisations
Swift Parrot Recovery Team

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Australian Government
Department of the Environment

National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

June 2018

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Image credits

Front Cover: Swift Parrot. (© Copyright, Chris Tzaros).

Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered breeding or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known breeding and foraging habitat at the landscape scale
4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Commented [A1]: Are these defined in this plan?

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population is increasing.
- ~~An~~ A Commonwealth and Tasmanian government agreed strategic management plan ~~for forestry~~covering land use activities that impact on the swift parrot is being implemented ~~in key Swift Parrot foraging and nesting regions~~ in Tasmanian.
- The Threatened Fauna Adviser recommendations are implemented and monitored in areas covered by the Tasmanian Forest Practices System
- A PAMA between DPIPWE and STT for the management of swift parrot breeding habitat is agreed and implemented in the Southern Forests region of Tasmania
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

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2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions that need to be taken to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) regulations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on

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these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no empirical estimates of population size or equivalent indices that could be used to estimate trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it has been demonstrated that the population is likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

***Table 1**: National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable
IUCN Red List of Threatened Species: (2017)	Critically Endangered

2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. Ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

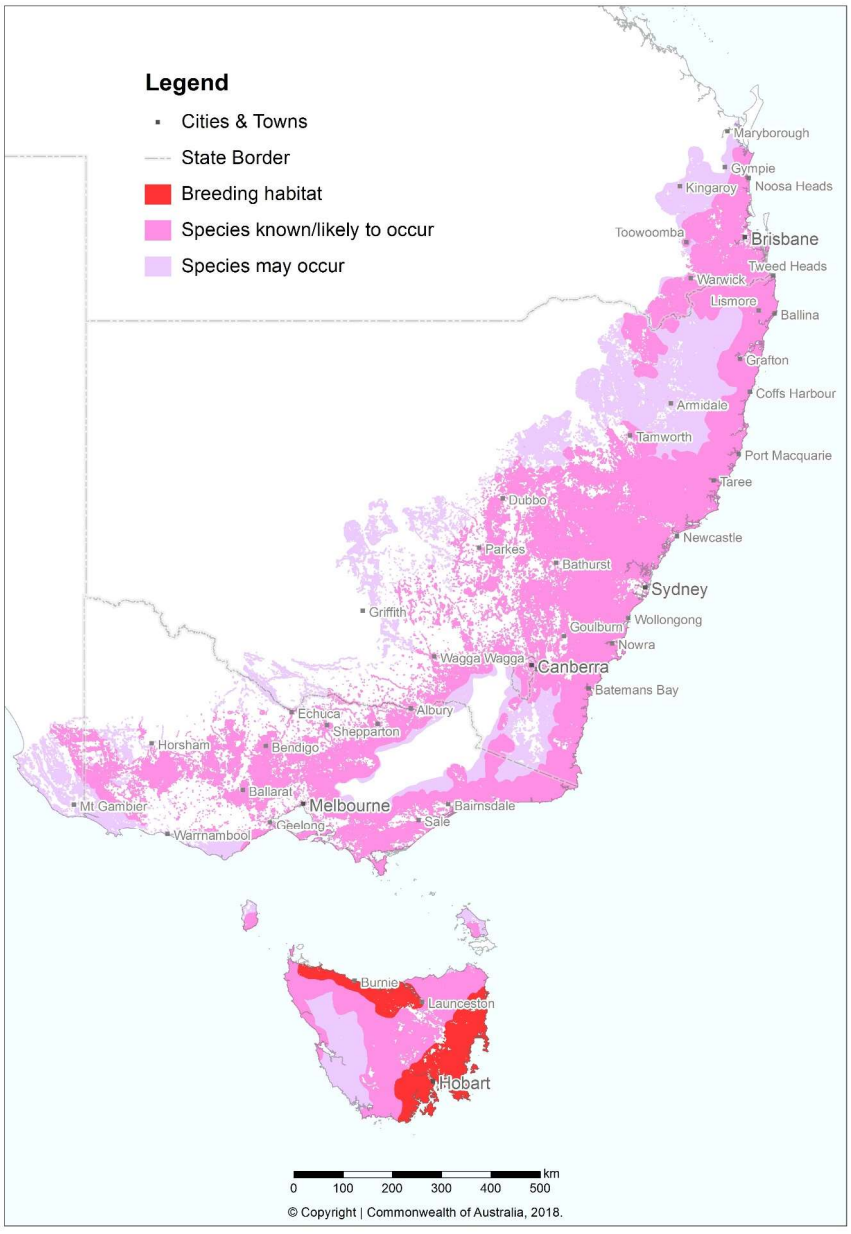

Figure 1 - Distribution of the Swift Parrot in Australia

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

Preliminary evidence now exists to support the predicted declines in population size. Unpublished data shows that between 2009 and 2015 the density of breeding Swift Parrots across the breeding range in any one year varied depending on the number of sites that were occupied i.e., the more sites used the less birds there were at any one sight. However, data from 2016 and 2017 show that this relationship might be breaking down. In those years there were generally low densities of birds across the range regardless of how many sites were being used for breeding. This is consistent with a decline in the population of breeding adults (Webb unpublished data).

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots overwinter on mainland Australia and nest in Tasmania. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculate*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

The distribution of Swift Parrots across the landscape will vary depending on the ~~flowing~~flowering of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. Ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast (Webb. Pers Comm.). Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height greater than 0.8 m, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch *et al.* 2008). However, based on the DBH of identified nest trees most are likely much older than this.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017). The protection of all nesting sites and associated foraging habitat is fundamental to the recovery of the species.

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds which are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to

five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any nesting or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered breeding or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, state forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and siting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting

resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and land clearing for conversion to tree plantations over the past 30 years has dramatically reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). In Tasmania, much of the forests that the Swift Parrot breed in are commercially harvested and subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999), and takes legal precedence over the EPBC Act.

~~Under the Tasmanian Forest Practices Act 1986, the management of threatened species is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code includes a set of 'Agreed Procedures' for the management of threatened species, intended to provide a stream-lined assessment process for threatened species in the context of wood production. The agreed procedures include measures to protect Swift Parrot habitat and nest trees. These procedures are currently detailed in the draft Swift Parrot Species Habitat Planning Guideline (FPA 2010).~~

Despite ~~comprehensive provisions in place to manage forestry operations in their breeding grounds,~~ the fact that the Regional Forest Agreement is supposed to be consistent with the requirements of the EPBC Act 1999, clearing or timber harvesting of swift parrot breeding habitat ~~still occurs~~followed the signing of the Agreement. Recent estimates of clearing in the identified Southern Forests Swift Parrot Important Breeding Area suggests that between 1997 and 2016 approximately 33% of all eucalypt forest was lost through conversion of native forest to plantation or disturbed through native forest harvesting and 23% of the identified old growth forest was lost (Webb et al. In press).

Under the Tasmanian Forest Practices Act 1986, the management of threatened species in areas subject to 'forest practices' defined in the Act is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code refers to a set of 'Agreed Procedures' (FPA and DPIPWE, 2014) for the management of threatened species in production forests, intended to provide a stream-lined risk assessment process for threatened species in the context of wood production. The agreed procedures refer to measures to protect Swift Parrot breeding habitat. These measures have evolved since 1996 and initially only applied to dry forest habitat (FPA 2010; Munks et al 2004) considered a priority for the species, based on existing information. In 2007 new information became available that suggested that wet forests were part of breeding habitat for Swift Parrots, probably particularly during periods when *E. globulus* flowering was poor in dry forests (Webb 2008; Law et al. 2000; B. Potts pers. comm.). The current measures for the management of swift parrot habitat cover wet and dry forest habitat throughout the breeding range of the species and are delivered through a decision support system, the Threatened Fauna Adviser (Forest Practices Authority, 2014). ~~Considering that~~Since swift parrot breeding habitat is poorly reserved (in formal CAR reserve system) in Tasmania there is considerable reliance on the measures

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Forest Practices Authority and DPIPWE (2014) Procedures for the management of threatened species under the forest practices system. Forest Practices Authority and Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania

Commented [A5]: The current recommendations are in the Threatened Fauna Adviser (2014)
See at
http://www.fpa.tas.gov.au/fpa_services/planning_assistance/advisory_planning_tools/threatened_fauna_advisor
Forest Practices Authority (2014) Threatened Fauna Adviser. Decision Support System. Forest Practices Authority, Hobart, Australia.

Commented [A6]: This is a bit misleading. Reads as if all the area lost or disturbed should have been protected by the management provisions. In fact there weren't any recommendations specific to the swift parrot in the southern forests until 2007. This was because the wet forest habitat was not considered a priority by specialists at the time. The 2010 planning guideline has a paragraph that explains this –
The Threatened Fauna Manual (now known as the Fauna Values Database) description of foraging-habitat previously focussed on dry forest types with a good representation of E. globulus and/or E. ovata (Brereton 1997; Swift Parrot Recovery Team 2001; FPB 2002). Since 2006, new information has resulted in significant changes to Swift Parrot management prescriptions delivered through the Forest Practices System and to Swift Parrot breeding-habitat descriptions. It is now recognised that wet forests are part of breeding habitat for Swift Parrots, probably particularly during periods when E. globulus flowering is poor in dry forests (Webb 2008; Law et al. 2000; B. Potts pers. comm.). In the 2007/08 breeding season, the majority of recorded nesting events were in wet forests, in the eastern portion of the Southern Forests and on South Bruny Island (Webb 2008).
It took us until 2010 to get an agreed approach to protecting this habitat.
The majority of the clearing was a result of one of the outcomes of the Commonwealth/Tas gov Regional Forest Agreement. Basically because of the new reserves resulting from this agreement there was intensification allowed outside the reserves – conversion of native forest to plantation. This was not a failure of the FPA/DPIPWE 'last resort' prescriptions delivered at the FPP scale, but was a perverse outcome of the RFA 1997.
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Forest Practices Authority and DPIPWE (2014) Procedures for the management of threatened species under the forest practices system. Forest Practices Authority and Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania

Commented [A8]: Munks, S., Richards, K., Meggs, J. and Brereton, R. 2004. The importance of adaptive management in 'off-reserve' conservation of forest fauna: implementing, monitoring and upgrading Swift Parrot *Lathamus discolor* conservation measures in Tasmania. - In: Lunney, D. (ed.) *The Conservation of Australia's Forest Fauna* (second edition). Royal Zoological Society of New South Wales, pp. 688-698.

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delivered through the Tasmanian forest practices system. Ongoing development of spatial information on nesting (Koch et al. 2018, in press) and foraging habitat availability and management approaches in off-reserve areas (Koch and Munks, 2018 in press) is urgently required to refine and ensure the effectiveness of these measures.

Nnesting hollows generally only occur in trees older than about 100 years of age, and ~~that~~ larger trees have proportionally more nectar and food resources. Therefore, ~~the~~ the ongoing logging of core breeding habitat remains a significant threat to the species' persistence in the wild.

Logging of foraging habitat on the Australian mainland also remains a threat. The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial logging operations on the mainland remain unknown.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with codes of practice which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern.

Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast's pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from negative impacts associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding and drought refuge habitats. However, predation on the nest by Sugar Gliders is now considered to be as significant a threat to the species, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings. Predation by Sugar Gliders has been recorded at most mainland Tasmania sites where Swift Parrots breed. On the Tasmanian mainland, predation rates are variable and likely interact with the extent of habitat disturbance from logging and other processes, with a positive relationship between nest survival and increasing mature forest cover at the landscape scale (Stojanovic et al., 2014).

Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling

parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change is likely to pose a significant threat to the Swift Parrot. Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

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8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research Birdlife

Strategy 2: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan,	Research

			with a focus on identifying key nesting and foraging areas.	
2.2	Undertake fine scale mapping of breeding habitat to inform management	1	• Fine scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine scale management.	Research
2.3	Continue research on breeding success, survival and mortality.	2	• Existing knowledge of breeding success, survival and mortality expanded • Research to include focus on establishing effectiveness of recovery plan actions.	Research
2.4	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	2	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH
2.5	Better understand site use, landscape use and habitat bottlenecks	2	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research Birdlife OEH DELWP
2.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.).	Research Birdlife

Strategy 3: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System. • Recommendations from ongoing review of Tasmanian Forest Practices System considered and implemented to increase the breeding success of Swift Parrots • Completion and implementation of an agreed strategic management plan for forestry activities in Tasmanian that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years. • Completion of the Public Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for PTPZL in the core breeding range of the Swift Parrot.	DoEE DPIPWE STT FPA
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research
3.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments	DoEE DPIPWE OEH DEHP DELWP

Commented [A10]: Why just forest practices. This Strategic plan should cover all landuse practices that impact on habitat. We need overarching goals and direction for the whole of government. Our individual industry regulatory mechanisms can then contribute to these overarching goals.

Commented [A11]: The biggest problem here is lack of compensation funding and the lack of transparent decision making. Shouldn't all C&C proposals be assessed at the Commonwealth level rather than through our system which isn't set up to assess and mitigate C&C of threatened species habitat.

			that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	
3.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide breeding habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research Birdlife NGOs
3.5	Regulate fire wood collecting	2	• Enforcement action targeted at reducing illegal firewood harvesters • Certification system introduced for legal fire wood harvesters to ensure timber supply sustainable.	DPIPWE
3.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
3.7	Manage key winter foraging sites	2	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
3.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
3.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP Birdlife NGOs

Strategy 4: Reduce impacts from Sugar Gliders at breeding sites

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
4.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the impacts of directly reducing Sugar Glider density (through trapping and euthanizing) on Swift Parrot breeding mortality and success.	Research
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	Research
4.5	Further investigate the link between forest condition and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
4.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DIPWE Research Birdlife
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key	DIPWE Research

			locations over the breeding season. • Strategy implemented	
4.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DIPWE Research Birdlife
4.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research
5.3	Encourage appropriate plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web • Informative displays are developed to educate the community • Network of Volunteers maintained to help assist in regional surveys	BirdLife Research
6.2	Engage indigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Indigenous landholders engaged and involved in Swift Parrot recovery plan activities.	All
6.3	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Commented [A12]: FPA staff actually spend a lot of time doing this. See our web-site for Field days/ training programs. This is an extremely important way of getting 'change'.

Strategy 7: Coordinate, review and report on recovery process

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

This Recovery Plan will be reviewed within five years of being made and will sunset within 10.

The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible government agencies and through additional funds obtained for the explicit purpose of implementing this Plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. Whilst only Priority 1 actions are costed in this recovery plan, this shouldn't deflect from any proposal to undertake Priority 2 or 3 actions. All actions are considered important steps towards ensuring the long-term survival of the species. Core government business not costed.

Table 2: *Summary of high priority recovery actions and estimated costs in ($000's) (costs are for first five years of implementation and don't take into account inflation over time)*

	Action	Cost					
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
1.1	Develop and apply techniques to estimate changes in population trajectory.						
2.1	Continue population monitoring program in the breeding range.						
2.2	Undertake fine scale mapping of breeding habitat to inform management						
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	Core government business					
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	Core government business					
3.3	Protect areas of 'habitat critical to survival' (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	Core government business					
3.4	Enhance existing breeding habitat	Core government business					
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas						
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows						

4.3.	Trial methods to reduce Sugar Glider density from key breeding areas	
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	
4.5	Further investigate the link between forest condition and predation rates	
4.6	Develop communication strategy specific to Sugar Glider management	
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	
4.8	Early detection, and control, of Sugar Glider introduction to islands	
4.9	Regulatory reform of Sugar Glider protected wildlife status	Core government business
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	
	Total	

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), Red-tailed Black Cockatoo (*Calyptorhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Commented [A13]: Hollow dependent species in general

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the requirement to provide offset funding for research, to secure or rehabilitate habitat, or for other threat mitigation work. Any further loss of forest and woodland habitat from areas known or likely to contain Swift Parrots is regarded as significant.

Swift parrot habitat has been modified through forestry operations, clearing, development, fragmentation and degradation. The more fertile areas not used for commercial forestry

operations have been targeted for agricultural pursuits. Restrictions on further clearing of Swift Parrot habitat will impact on some landowners/managers and developers. These restrictions are not predicted to impact significantly on agricultural industries since the remnants of these forest communities are generally located on less fertile soils and are, therefore, relatively unattractive for grazing or cropping.

Public and private forestry harvesting operations remain a significant threat to the Swift Parrot. The retention of nesting areas and a suitable number of large mature trees for nectar production and to provide foraging habitat is required. Application of suitable prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot may reduce the volume of timber available for harvesting. The management of forestry operations is carried out under the provisions of the Regional Forest Agreements, with the management prescriptions being developed and implemented by State Governments and the associated forestry managers.

The Swift Parrot is a charismatic species whose plight raises awareness of the conservation problems faced by a diversity of threatened species. A large network of community volunteers across eastern Australia actively participate in Birdlife Australia coordinated annual surveys for the species. By conducting surveys in their local area, undertaking habitat restoration projects and attending educational workshops each year. Such involvement provides social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organizations, to categorize ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged or is varied to remove completed actions and include new conservation priorities
- whether a recovery plan is no longer necessary for the species because either a Conservation Advice will suffice, or the species is removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department of the Environment and Energy in association with relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania - DIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations

Commented [A14]: FPA?

15 References

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Australian Government
Department of the Environment

National Recovery Plan for the Swift Parrot *(Lathamus discolor)*

June 2018

The Species Profile and Threats Database pages linked to this recovery plan is obtainable from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Image credits

Front Cover: Swift Parrot. (© Copyright, Chris Tzaros).

Table of contents

Figures and tables

1 Summary

Swift Parrot (*Lathamus discolor*)

Family: Psittacidae

Current status of taxon:
Critically Endangered *(Environment Protection and Biodiversity Conservation Act 1999)*

Distribution and habitat:

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia for winter, where it forages across a broad range of forest types. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km^2.

Habitat critical for survival:

Habitat critical to the survival of the Swift Parrot includes:

- Any known nesting sites or foraging areas where the species is known or likely to occur (as shown in Figure 1).
- Any newly discovered ~~breeding~~nesting sites or important foraging areas.

Recovery plan Vision, Objective and Strategies:

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known breeding and foraging habitat at the landscape scale
4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

Criteria for success:

This recovery plan will be deemed successful if, within 10 years, the following have been achieved:

- The Swift Parrot population is increasing.
- ~~An agreed strategic management plan for forestry activities is being implemented in key Swift Parrot foraging and nesting regions in Tasmanian.~~
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

2 Introduction

This document constitutes the National Recovery Plan for the Swift Parrot (*Lathamus discolor*). The plan considers the conservation requirements of the species across its range and identifies the actions that need to be taken to improve the species' long-term viability. This recovery plan supersedes the 2011 National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011).

The Swift Parrot is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The listing status of the Swift Parrot was re-assessed in 2016 due to new information showing predation of females and nestlings by the introduced (to Tasmania) Sugar Glider (*Petaurus breviceps*). The re-assessment concluded that the risk posed by this previously unidentified threat was significant enough to justify moving the species from the Endangered category to the Critically Endangered category of the EPBC Act list of Threatened Species. The re-assessment also concluded that the recovery plan should be updated to include measures to reduce the impact of Sugar Gliders.

The 2011 Recovery Plan was reviewed by the Swift Parrot Recovery Team in 2016-2017. The review concluded that the previous plan resulted in:

- Increased understanding of the habitat features associated with breeding;
- Progress in developing Tasmanian forestry management protocols in the breeding areas, and integrating these into Forest Practice Authority (FPA) ~~regulations~~ management recommendations. However, the review highlighted that issues remained with the implementation of the FPA regulations. The Review also identified that there had been limited work across other jurisdictions on Swift Parrot habitat management; and
- Some work was being done on monitoring and managing the threat from collisions, competition and beak and feather disease. However, the review found that work on these threats was not prioritised as they were considered to have low overall impact on the species survival compared to habitat loss and the impacts of Sugar Glider predation.

Overall the review found that trend information for Swift Parrots remained uncertain, as there was no empirical estimates of population size or equivalent indices that could be used to estimate trend. However, based on modelling of known reproductive success parameters and predation by Sugar Gliders, it has been demonstrated that the population is likely declining. The Review also concluded that at the time of writing the 2011 Recovery Plan the Sugar Glider threat was not recognised and that, as a result, the plan was lacking any recovery actions to address that threat. The Review concluded that a new recovery plan should be developed for the Swift Parrot to account for predation by Sugar Gliders and the ongoing loss of breeding habitat in Tasmania.

The accompanying Species Profile and Threats Database (SPRAT) provides additional background information on the biology, population status and threats to the Swift Parrot. SPRAT pages are available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2.1 Conservation status

The Swift Parrot is listed as threatened under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and in all parts of its range.

***Table 1**: National and state conservation status of the Swift Parrot*

Legislation	Conservation Status
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Critically Endangered
Biodiversity Conservation Act 2016 (New South Wales)	Endangered
Nature Conservation Act 1992 (Queensland)	Endangered
National Parks and Wildlife Act 1972 (South Australia)	Endangered
Flora and Fauna Guarantee Act 1988 (Victoria)	Threatened
Nature Conservation Act 2014 (Australian Capital Territory)	Vulnerable
IUCN Red List of Threatened Species: (2017)	Critically Endangered
Threatened Species Protection Act 1995 (Tasmania)	Endangered

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2.2 Swift Parrot Recovery Team

Recovery teams help implement recovery plans. They include representatives from organisations with a direct interest in the recovery of the species, including from government, conservation groups and species experts. Membership of the Swift Parrot Recovery Team currently includes individuals with relevant expertise from the Australian Government, the range state governments (Tasmanian, South Australia, Victorian, New South Wales and the ACT), BirdLife Australia, as well as species experts and research scientists.

3 Background

3.1 Species description

The Swift Parrot (White 1790) is a small fast-flying, nectarivorous parrot which occurs in eucalypt forests in south eastern Australia. Bright green in colour, the Swift Parrot has patches of red on the throat, chin, face and forehead which are bordered by yellow. It also has red on the shoulder and under the wings and blue on the crown, cheeks and wings. A distinctive call of pip-pip-pip (usually given while flying), a streamlined body, long pointy tail and flashes of bright red under the wing enable the species to be readily identified.

3.2 Distribution

The Swift Parrot breeds in Tasmania during the summer and migrates north to mainland Australia for winter (Figure 1). The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania, with location of breeding each year being determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ~~Ovata~~ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017). Swift Parrots also occasionally breed in the north-west of the state, between Launceston and Smithton, however the number of birds involved is low as potential breeding habitat remaining in the north-west is scarce and highly fragmented. Swift Parrots have also been found breeding in isolated patches of blue gum on the west coast of Tasmania near Zeehan, and on King Island and Flinders Island (Webb unpublished data).

Swift Parrots disperse widely on the mainland, foraging on flowers and lerps in Eucalyptus species, mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region.

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions in New South Wales tend to support larger numbers of birds when inland habitats are subjected to drought, as occurred in 2002 and 2009 (Tzaros et al. 2009).

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia (Saunders and Tzaros 2011).

3.3 Population

The Swift Parrot occurs as a single, migratory population (Stojanovic et al. 2018). The most recent population estimate was done for the Bird Action Plan 2010, which suggested there were approximately 2,000 mature individuals in the wild (Garnett et al. 2011). There are no more recent estimates of population size. While the current population size might be unknown, recent research has shown that the Swift Parrot population is likely undergoing dramatic declines due to predation by Sugar Gliders, an introduced species to Tasmania (Campbell et al. 2018). Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were

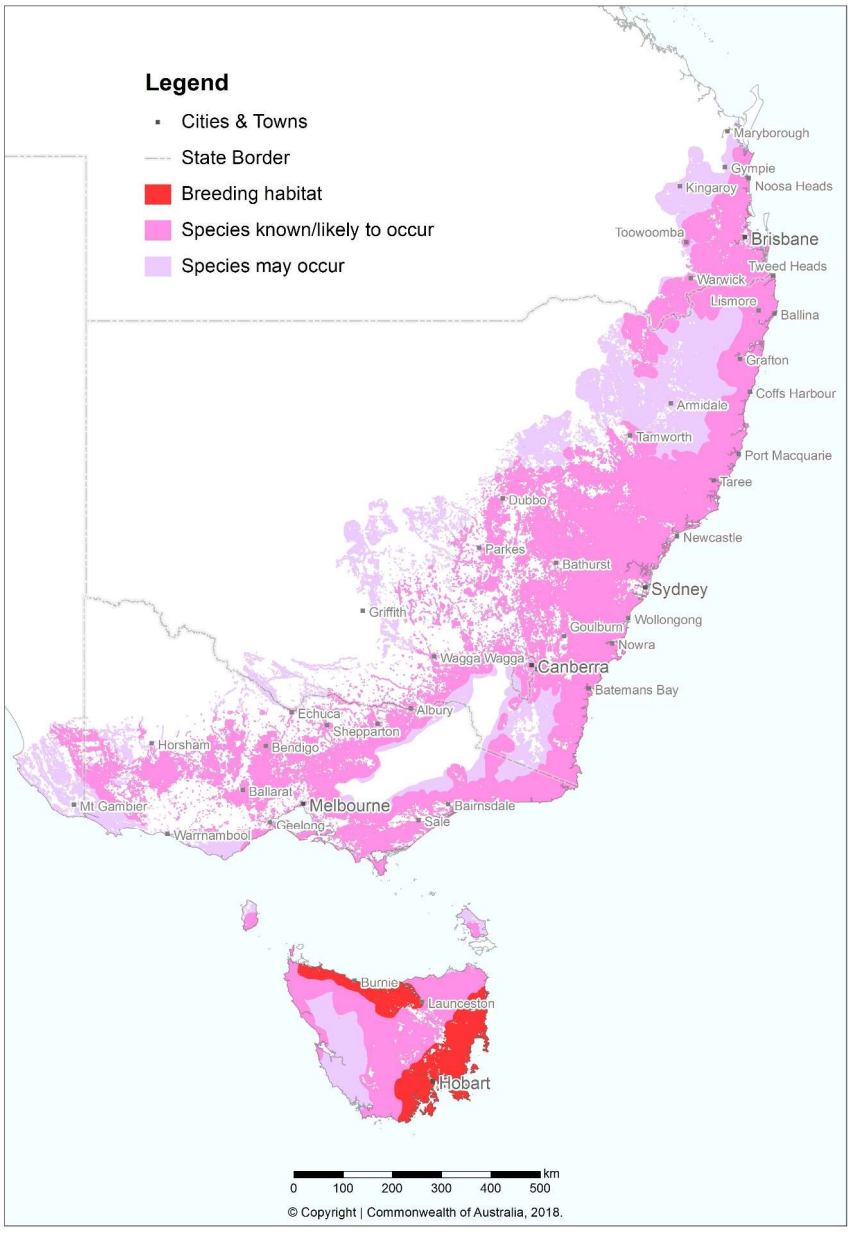

Figure 1 - Distribution of the Swift Parrot in Australia

Commented [A1]: See attached map – Core habitat is "known/likely to occur" and Potential is species may occur. Breeding habitat is much finer scale on the map – know n nest sites/localities.

shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings.

Heinsohn et al. (2015) constructed a population viability analysis (PVA) using the demographic data gained from the Sugar Glider predation study and population monitoring (Stojanovic et al., 2014; Webb et al., 2014). Five scenarios were considered in the PVA. The first scenario was based on field data from Bruny and Maria Islands, which are both Sugar Glider free. This scenario estimated growth rates in the absence of Sugar Glider predation and projected a substantial increase in numbers over time. Four other PVA models were tested which accounted for Sugar Glider predation but used differing generation times.

The mean decline over the four scenarios that included Sugar Glider predation was projected at 86.9 percent (range over the four models was 78.8-94.7 percent decline) over three generations. The preferred model by Heinsohn et al. (2015) projected that Swift Parrots would undergo an extreme decline of 94.7 percent within a three generation period. This model used a generation time of 5.4 years, which was obtained through expert elicitation (Garnett et. al., 2011). While research has found that that breeding success is much higher on Sugar Glider free islands (Stojanovic et al., 2014), this greater success was insufficient to buffer the population against collapse under the modelled scenarios (Heinsohn et al., 2015).

Preliminary evidence now exists to support the predicted declines in population size. Unpublished data shows that between 2009 and 2015 the density of breeding Swift Parrots across the breeding range in any one year varied depending on the number of sites that were occupied i.e., the more sites used the less birds there were at any one ~~sight~~site. However, data from 2016 and 2017 show that this relationship might be breaking down. In those years there were generally low densities of birds across the range regardless of how many sites were being used for breeding. This is consistent with a decline in the population of breeding adults (Webb unpublished data).

Commented [A2]: Unpublished data should not be used in the plan – as there is inadequate opportunity to review. The review in 2016-17 quoted earlier in this plan in the Introduction contradicts this paragraph – stating that there is no estimates of population size that could be used to estimate trend.

4 Biology and Ecology

4.1 Longevity

Generation length is estimated at approximately 5.4 years, but this estimate is considered to be of low reliability. This figure is derived from an age of first breeding of two years and a maximum longevity of 8.8 years (Garnett et al., 2011).

4.2 Habitat

Mainland habitat

Swift parrots overwinter on mainland Australia and nest in Tasmania. Figure 1 illustrates the known distribution of the species. During the non-breeding season the population frequents eucalypt woodlands and forests in South Australia, Victoria, New South Wales and Queensland. Key foraging species includes Yellow Gum (*Eucalyptus leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum *E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculate*). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law et al. 2000).

The distribution of Swift Parrots across the landscape will vary depending on the flowing of key foraging species.

Tasmania

Breeding records for Swift Parrots are largely restricted to the south and east coast, with some sporadic breeding occurring in the north of the state. Birds arrive in Tasmania in early August and breeding occurs between September and January. The distribution of nesting Swift Parrots each breeding season is determined largely by the distribution and intensity of blue gum (*E. globulus)* and black gum (*E. ~~Ovata~~ovata*) flowering (Webb et al. 2014). The flowering patterns on these species varies dramatically in location and extent over annual cycles (Webb et al. 2017).

Swift parrots nest in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 30 km of the coast (Webb. Pers Comm.). Swift parrots nest in any eucalypt forest that supports suitable tree hollows, providing a suitable food source is within foraging range. Nest sites have been recorded in dry and wet eucalypt forest types. Swift parrots select trees and forest patches with a relatively higher number of potential hollows (Voogdt 2006, Webb et al. 2012). Nest trees are typically characterised by having a diameter at breast height greater than 0.8 m, several visible hollows and showing signs of senescence (Webb et al. 2012; Stojanovic et al 2012). Eucalypt trees in Tasmania usually take at least 100 years to form hollows, and at least 140 years to form deeper hollows (Koch *et al.* 2008). However, based on the DBH of identified nest trees most are likely much older than this.

Commented [A3]: Swift Parrot or Swift parrot, I suspect the latter is more correct but either way it should be consistent

Commented [A4]: Webb et al (2012)found nest trees had a mean diameter of 105cm and Stojanovic et al (2012), 102cm.

The prevalence of hollows in eucalypt forests and woodlands and close proximity to a foraging resource is considered more important than forest type and/or tree species in determining where nests occur. Where suitable hollows are available, nest sites can be found in all topographic positions and aspects (Webb et al. 2012).

Swift Parrots are known to reuse nesting sites and individual nest hollows over different years (Stojanovic et al. 2012) and this highlights the importance of these areas for the species' long-term viability. The presence of a foraging resource will determine whether an area is suitable on a year to year basis (Webb et al. 2014). Monitoring of blue gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east show that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas (Webb et al. 2014; 2017). The protection of all known nesting sites and associated foraging habitat is fundamental to the recovery of the species.

4.3 Breeding biology

Both sexes are involved in the search for suitable nest hollows which begins soon after they arrive in Tasmania. Nesting commences in late September, however birds which are unpaired on arrival in Tasmania may not begin nesting until November, after they have found mates (Brown 1989). Gregarious by nature, pairs may nest in close proximity to each other and even in the same tree.

The female occupies the nest chamber just before egg laying and she undertakes all of the incubation and brooding until nestlings are sufficiently developed. The usual clutch size is four eggs but up to five may be laid. During incubation the male visits the nest site every three to

five hours to feed the female. He perches near the nest and calls her out, either feeding her at the nest entrance or both will fly to a nearby perch.

Reproductive success is strongly influenced by the availability and intensity of blue and/or black gum flowering, and nest site selection with regard to the presence of Sugar Gliders. In years where birds breed primarily on Bruny and Maria Islands, breeding success is much higher as Sugar Gliders are not found on these islands (Stojanovic et al. 2014, 2015).

4.4 Habitat critical for survival

Habitat critical to the survival of the Swift Parrot includes:

- Any known nesting sites or foraging areas where the species is known or likely to occur (as shown in figure 1).
- Any newly discovered ~~breeding~~ nesting sites or important foraging areas.

Habitat critical to the survival of the Swift Parrot occurs across a wide range of land tenures, including on freehold land, travelling stock routes and reserves, ~~state~~ publically owned forests and state reserves, and National Parks. It is essential that the highest level of protection is provided to these areas and that enhancement and protection measures target these productive sites.

When considering developments in any part of the parrot's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year remain an important tool in establishing the areas importance for Swift Parrots. In addition, it is also important to note that Swift Parrots opportunistically use areas depending on the occurrence of eucalypt flowering. So areas that may be important habitat over time might not have birds in any given year. This pattern of habitat use means that recent survey data and historical records need to be considered when assessing the relative importance of a region for Swift Parrots.

5 Threats

5.1 Historical causes of decline

Area of occupancy has declined significantly since European settlement, as can be inferred from the extent of habitat loss. For example, 83% of box-ironbark habitat (the principal wintering habitat of the Swift Parrot on the mainland) has been cleared in Victoria, and 70% has been cleared in New South Wales (Environment Conservation Council 2001; Robinson & Traill 1996; Siversten 1993). White Box-Yellow Gum-Blakely's Red Gum woodland, another important habitat in New South Wales, has been reduced to less than 4% of its pre-European extent on the south-western slopes and southern tablelands of New South Wales (Saunders 2003); and in Tasmania, approximately 70% of grassy Tasmanian blue gum forest (Saunders and Tzaros 2011), and over 90% of *E. ovata* forest (Department of Environment and Energy 2018) that provide important foraging habitat during the breeding season has been cleared.

5.2 Current threatening processes

The major threats to the survival of the Swift Parrot are the ongoing loss of breeding and foraging habitat in Tasmania through forestry operations and land clearing, and predation by Sugar Gliders of nestlings and siting females. Managing these threats is the primary focus of this Recovery Plan. Other identified threats include competition for foraging and nesting

resources, mortality from collisions with human-made objects and impacts from climate change. These threats are described in more detail below.

Habitat loss and alteration

Forestry

Forestry operations and ~~land clearing for~~ conversion of native forest to tree plantations over the past 30 years has ~~dramatically~~ reduced the amount of available Swift Parrot nesting and foraging habitat (Prober & Thiele 1995; Saunders et al., 2007, Saunders & Tzaros 2011, Webb et al. 2017). In Tasmania, ~~much of~~ the forests that the Swift Parrot breed in are ~~commercially harvested and~~ subject to management under the Tasmanian Regional Forest Agreement 1997 (RFA). The RFA has been assessed and is considered to be consistent with the requirements for threatened species protection and recovery that otherwise might apply under the EPBC Act (1999)~~., and takes legal precedence over the EPBC Act.~~ .

Under the Tasmanian Forest Practices Act ~~1986~~1985, the management of threatened species is guided by the Forest Practices Code (the Code) and regulated by the Forest Practices Authority (FPA). The Code includes a set of 'Agreed Procedures' between DPIPWE and the FPA for the management of threatened species, intended to provide a stream-lined assessment process for threatened species in the context of wood production. ~~The agreed procedures include measures to protect Swift Parrot habitat and nest trees.~~ These ~~procedures~~ management recommendations for the swift parrot are published in the Threatened Fauna Adviser (FPA 20XX)~~are currently detailed in the draft Swift Parrot Species Habitat Planning Guideline (FPA 2010)~~.

Despite comprehensive provisions in place to manage forestry operations in their breeding grounds, clearing or timber harvesting of breeding habitat sill occurs. Recent estimates of clearing in the identified Southern Forests Swift Parrot Important Breeding Area suggests that between 1997 and 2016 approximately 33% of all eucalypt forest was lost or disturbed and 23% of the identified old growth forest was lost (Webb et al. In press). ~~Considering that nesting hollows generally only occur in trees older than about 100 years of age, and that larger trees have proportionally more nectar and food resources, the ongoing logging of core breeding habitat remains a significant threat to the species' persistence in the wild.~~

Commented [A5]: Refer discussion. Context needs to be included if this is to remain – additionally as per previous such information needs to be validated and unpublished data is not available for this purpose.

~~Logging of foraging habitat on the Australian mainland also remains a threat.~~ The extent of forest loss over Swift Parrot foraging habitat on the mainland has not been quantified and the impacts from commercial logging operations on the mainland remain unknown.

Firewood collection – illegal and legal

Firewood collection is a threat to nesting and foraging habitat in Tasmania and to foraging habitat on mainland Australia. Trees targeted by firewood collectors are often large, mature forage trees or trees with suitable nesting hollows. Generally registered firewood suppliers operate in accordance with codes of practice which typically includes provisions to not collect from areas that might have an impact on threatened species. However, there is a large, but unquantified unregulated and illegal harvest of firewood, and these collectors are known to be impacting on Swift Parrot habitat.

Commented [A6]: Is this intended to be the Forest Practices Code in Tasmania?

Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced,

resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997). Fires may also cause the collapse of hollow bearing trees, thus reducing hollow availability into the future. One long-term study looked at survival of nest trees over time and found that unburned trees mostly survived but that nearly half of the trees burnt with cavities collapsed within six months of burning (Stojanovic et al., 2015).

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, with important breeding areas in Tasmania and key foraging areas in Victoria, New South Wales and Queensland being of particular concern. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons', including as part of establishing and maintaining fire breaks.

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats, such as those around Bendigo. In New South Wales, urban and industrial expansion, particularly on the central and north coast's pose an ongoing threat to winter foraging regions. In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from negative impacts associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes are forest remnants or isolated, scattered paddock trees. This habitat continues to be lost through senescence; dieback; over grazing, with limited or no recruitment; and through ongoing removal of paddock trees to enhance farm productivity. This is of particular concern in eastern Tasmania, central Victoria and throughout New South Wales.

Predation by Sugar Gliders

Until recently the main threat to Swift Parrots was thought to be habitat loss and alteration within breeding and drought refuge habitats. However, predation on the nest by Sugar Gliders is now considered to be as significant a threat to the species, as Sugar Gliders take not only the young or eggs in the nest but also often kill the sitting female (Stojanovic et al. 2014; Heinsohn et al., 2015). While a species native to the Australian mainland, Sugar Gliders were likely introduced to mainland Tasmania around 1835 (Campbell et al. 2018).

Stojanovic et al. (2014) found that Swift Parrot nests failed at a very high rate on the Tasmanian mainland, compared to no failure on offshore islands where Sugar Gliders were shown to be absent. Most cases of glider predation resulted in the death of the adult female parrot, and always involved the death of either eggs or nestlings. Predation by Sugar Gliders has been recorded at most mainland Tasmania sites where Swift Parrots breed. On the Tasmanian mainland, predation rates are variable and likely interact with the extent of habitat disturbance from logging and other processes, with a positive relationship between nest survival and increasing mature forest cover at the landscape scale (Stojanovic et al., 2014).

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Collision mortality

Collisions with wire netting, mesh fences, windows and cars cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are concentrated in or near to urban areas. The construction of wind energy turbines in south-eastern Australia may also have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift parrots can experience increased competition for resources from large, aggressive honeyeaters within altered habitats (Ford et al., 1993; Grey et al., 1998), and from introduced birds and bees (Brown 1989; Paton 1993; Hingston et al., 2004; Heinsohn et al., 2015). Swift parrots compete with honeybees (*Apis mellifera*) and starlings for tree cavities, where nestling parrots can be killed and the cavities usurped (Heinsohn et al., 2015). This competition is worst in forest that is disturbed or fragmented (Stojanovic, D. Unpublished Data).

Climate change

Loss of nesting and foraging habitat from climate change is likely to pose a significant threat to the Swift Parrot. Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

6 Populations under particular pressure

Genetic analysis confirms that Swift Parrots form a single, genetically homogenous, breeding population (Stojanovic et al. 2018). Therefore, the actions described in this recovery plan are designed to provide ongoing protection for all Swift Parrots throughout their range.

7 Recovery plan vision, objective and strategies

Long-term Vision

The Swift Parrot population has increased in size to such an extent that the species no longer qualifies for listing as threatened under the any of the Environment Protection and Biodiversity Conservation Act (1999) listing criteria.

Recovery Plan Objective

The objective of this plan is to achieve a demonstrable and sustained increase in the wild Swift Parrot population over the next 10 years. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range.

Strategies to achieve objective

1. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
2. Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures
3. Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale
4. Reduce impacts from Sugar Gliders at key breeding sites
5. Monitor and manage other sources of mortality
6. Engage community and stakeholders in Swift Parrot conservation
7. Coordinate, review and report on recovery process

8 Actions to achieve specific objectives

Actions identified for the recovery of the Swift Parrot are described below.
It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the recovery plan. Priorities assigned to actions should be interpreted as follows:

Priority 1: Action is necessary in order to mitigate the key threats to the Swift Parrot and also provide valuable information to help identify long-term population trends.

Priority 2: Action would provide a more informed basis for the long-term management and recovery of the Swift Parrot.

Priority 3: Action is desirable, but not critical to the recovery of the Swift Parrot or assessment of trends in that recovery.

Strategy 1: Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*
1.1	Develop and apply techniques to estimate changes in population trajectory.	1	• Changes in abundance of Swift Parrots estimated over time. • Current Population Viability Analysis updated to include new information.	Research Birdlife

Strategy 2: Improve understanding of foraging and breeding habitat use at a landscape scale in order to better target protection and restoration measures

Action		Priority	Performance Criteria	Responsible Agencies *and potential partners*
2.1	Continue population monitoring program in the breeding range.	1	• Monitoring program continued throughout the life of this plan, with a focus on identifying key nesting and foraging areas.	Research
2.2	Undertake fine scale mapping of breeding habitat to inform management	1	• Fine scale mapping of breeding areas undertaken for each breeding season for the life of this plan. • Nest tree locations identified, mapped and entered into database to assist with fine scale management.	Research
2.3	Continue research on breeding success, survival and mortality.	2	• Existing knowledge of breeding success, survival and mortality expanded • Research to include focus on establishing effectiveness of recovery plan actions.	Research
2.4	Develop standardised survey program to better understand habitat occupancy during the non-breeding season.	1~~2~~	• Standardised survey program developed and trialled on mainland Australia during non-breeding season • Winter survey program implemented on an annual basis over the life of this recovery plan	Research Birdlife OEH

Commented [A8]: This seems to be an important action

2.5	Better understand site use, landscape use and habitat bottlenecks	12	• Key winter foraging sites identified and documented. • Key breeding sites identified and documented. • Broad scale movement patterns across the landscape better understood. • Changes over time in regions and habitats used analysed against such factors as eucalypt flowering patterns and climate variability.	Research Birdlife OEH DELWP
2.6	Use climate modelling techniques to investigate the potential influence of climate change on eucalypt flowering to identify potential refuge for the Swift Parrot over the next 100 years.	2	• Modelling to identify key areas of existing habitat that will become key refuge for the Swift Parrot over the next 100 years • Consideration ~~taken to protect identified areas through private and public conservation arrangements (e.g., covenanting, reserves, national parks etc.)~~ given to ehnace formal protection for sites where appropriate (i.e, through new reserves etc)	Research Birdlife

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Strategy 3: Manage and protect known Swift Parrot breeding and foraging habitat at the landscape scale

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	1	• Monitoring and ongoing review of the implementation and effectiveness of the current management recommendations delivered through the Tasmanian Forest Practices System. • Recommendations from ongoing review ~~of Tasmanian Forest Practices System~~ considered and implemented ~~to increase the breeding success of Swift Parrots~~. • ~~Completion and implementation of an agreed strategic management plan for forestry activities in Tasmanian that is consistent with the objective of achieving a sustained increase in the Swift Parrot population over the next 10 years.~~ • Completion of the Public	DoEE DPIPWE STT FPA

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			Authority Management Agreement (PAMA, under the TSPAct, 1995) between DPIPWE and Sustainable Timber Tasmania for ~~the core breeding range~~ PTPZ land in the Southern Forests ~~of the Swift Parrot~~.	
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	1	• New information on breeding and foraging locations is incorporated into the existing regulations, codes of practice, management recommendations, and planning tools and procedures to better manage the Swift Parrot population across its range.	DPIPWE STT FPA Research
3.3	Protect areas of 'habitat critical to survival' not managed under an RFA agreement (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	1	• Large scale developments avoided on areas of 'habitat critical to survival' for the Swift Parrot. • Clearing of mature foraging and nesting trees in areas of 'habitat critical to the survival' of the Swift Parrot has been limited. • Any developments in areas of 'habitat critical to survival' have incorporated suitable threat mitigation measures. • If avoidance or mitigation were not possible, any developments that proceeded in areas of 'habitat critical to survival' provided suitable offsets using the approved offset calculators and/or provided direct support for recovery plan actions.	DoEE DPIPWE OEH DEHP DELWP
3.4	Enhance existing breeding habitat	1	• Manage regenerating and regrowth blue gum or black gum forest to provide ~~breeding~~ foraging habitat into the future. • Encourage large-scale plantings of blue gum and black gum by land holders and land managers in priority areas through a strategic landscape approach.	DPIPWE STT Research Birdlife NGOs
3.5	Regulate fire wood collecting	12	• Enforcement action targeted at reducing illegal firewood harvesters • Certification system introduced for legal fire wood harvesters to ~~ensure timber supply sustainable~~demonstrate wood is harvested in accordance with Codes of Practice.	DPIPWE

Commented [A11]: Pretty general, does this mean regenerate native forest as native forest i.e. no conversion or something more specific?

3.6	Where useful, develop agreements with local councils and government agencies that aim to maintain and enhance Swift Parrot breeding habitat.	2	• Management agreements developed with local councils and government agencies which maintain and enhance Swift Parrot breeding habitat. • Reporting mechanisms in place to capture the outcomes of land use decisions and planning involving Swift Parrot breeding habitat.	DPIPWE OEH DEHP DELWP
3.7	Manage key winter foraging sites	12	• Management plans for key winter foraging sites (identified in Action 2.5) developed and implemented. • Consideration given to enhance formal protection for sites where appropriate (i.e, through new conservation reserves, national parks etc).	OEH DEHP DELWP
3.8	Identify and protect remnants of state and Commonwealth owned land in areas of 'habitat critical for survival' for Swift Parrots (as defined in Section 4.4).	3	• Unprotected state and Commonwealth owned remnants in areas of 'habitat critical to survival' for Swift Parrots identified. • Management plans developed to maximise conservation values of the identified sites.	DoEE DPIPWE OEH DEHP DELWP Birdlife NGOs
3.9	Incorporate Swift Parrot conservation priorities into covenanting and other private land conservation programs.	3	• Key breeding and foraging sites on private land identified and habitat quality assessed. • Identified sites protected through covenanting and other private land conservation programs.	DPIPWE OEH DEHP DELWP Birdlife NGOs

Strategy 4: Reduce impacts from Sugar Gliders at breeding sites

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas	1	• Sugar Glider density across key Swift Parrot breeding areas known and mapped.	Research
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows	1	• Sugar Glider exclusion trials undertaken in key Swift Parrot breeding areas. • Different exclusion methods assessed for effectiveness.	Research
4.3	Trial methods to reduce Sugar Glider density from key breeding areas	1	• Trials undertaken testing the impacts of predator playbacks on Sugar Glider density and Swift Parrot mortality and success. • Trials undertaken testing the	Research

			impacts of directly reducing Sugar Glider density (through trapping and euthanizing) on Swift Parrot breeding mortality and success.	
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	1	• Improved understanding of the re-colonisation dynamics of Sugar Gliders resulting from local, management induced, population reductions. • Improved understanding of the breeding and foraging ecology of Sugar Gliders in south-east Tasmania	Research
4.5	Further investigate the possible link between forest condition, Sugar Glider density and predation rates	1	• Improved understanding of the link between forest cover, patch size, Sugar Glider density and Swift Parrot predation rates and breeding success.	Research
4.6	Develop communication strategy specific to Sugar Glider management	1	• Targeted communications strategy developed that communicates why Sugar Glider numbers need to be controlled. Outputs of strategy may include social media, pamphlets and community presentations.	DPIPWE Research Birdlife
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	1	• Strategy developed to manage Sugar Glider population across key breeding areas. Strategy may include increased use of nest protection methods and/or programs to directly reduce Sugar Glider numbers, with a particular focus on reductions at key locations over the breeding season. • Strategy implemented	DPIPWE Research
4.8	Early detection, and control, of Sugar Glider introduction to islands	1	• Process developed and implemented to ensure early detection of Sugar Gliders on islands where Swift Parrots breed but which are currently Sugar Glider free. • Management plan to control Sugar Gliders on key islands developed and approved. Management plan to include funded rapid response protocols.	DPIPWE Research Birdlife
4.9	Regulatory reform of Sugar Glider protected wildlife status	1	• Sugar gliders removed from Schedule 2 of the Tasmanian Wildlife (General) Regulations 2010.	DPIPWE

Strategy 5: Monitor and manage other sources of mortality.

ACTION		Priority	Performance Criteria	Responsible Agencies *and potential partners*
5.1	Continue to raise public awareness of the risks of collisions and how these can be minimised.	2	• Existing collision impact guidelines updated as required and made accessible.	All
5.2	Monitor for outbreaks of disease (e.g. of Psittcine Beak and Feather Disease), that may impact on the viability of the wild population.	2	• Incidence of disease recorded during handling and monitoring of Swift Parrots. • Management strategy developed if incidence of disease is noted to be increasing.	DoEE DPIPWE OEH DEHP DELWP Birdlife Research
5.3	Encourage appropriate plantings in urban areas to discourage foraging Swift Parrots, and hence reduce collision mortality.	3	• Guidelines developed and disseminated to land managers to encourage appropriate plantings in urban areas.	DPIPWE Birdlife

Strategy 6: Engage community and stakeholders in Swift Parrot conservation

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	1	• Articles about Swift Parrot conservation are published in newsletters, local bulletins, and on the web • Informative displays are developed to educate the community • Network of Volunteers maintained to help assist in regional surveys	BirdLife Research
6.2	Engage Iindigenous landholders where appropriate to undertake Recovery Plan related activities.	2	• Indigenous landholders engaged and involved in Swift Parrot recovery plan activities.	All
6.3	Ensure educational material on threats and management of Swift Parrot habitat available to land managers	2	• Educational awareness material developed and/or updated. • Material disseminated to state and local governments, consultants and resource managers.	All

Strategy 7: Coordinate, review and report on recovery process

ACTION		**Priority**	Performance Criteria	Responsible Agencies *and potential partners*
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	• National Swift Parrot Recovery Team continues to operate under agreed Terms of Reference.	All

9 Duration and cost

This Recovery Plan will be reviewed within five years of being made and will sunset within 10.

The cost of implementation of this plan should be incorporated into the core business expenditure of the responsible government agencies and through additional funds obtained for the explicit purpose of implementing this Plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. Whilst only Priority 1 actions are costed in this recovery plan, this shouldn't deflect from any proposal to undertake Priority 2 or 3 actions. All actions are considered important steps towards ensuring the long-term survival of the species. Core government business not costed.

Table 2: *Summary of high priority recovery actions and estimated costs in ($000's) (costs are for first five years of implementation and don't take into account inflation over time)*

	Action	Cost					
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
1.1	Develop and apply techniques to estimate changes in population trajectory.						
2.1	Continue population monitoring program in the breeding range.						
2.2	Undertake fine scale mapping of breeding habitat to inform management						
3.1	Ongoing state and Commonwealth commitment to support strategic planning for Swift Parrot breeding habitat in areas subject to forest practices	Core government business					
3.2	Review and revise Swift Parrot management recommendations, planning tools and procedures as new information becomes available.	Core government business					
3.3	Protect areas of 'habitat critical to survival' (as described in Section 4.4) from large scale developments and land clearing (e.g., from residential developments, mining activity, wind and solar farms, and clearing for agriculture).	Core government business					
3.4	Enhance existing breeding habitat	Core government business					
4.1	Determine Sugar Glider density across key Swift Parrot breeding areas						
4.2	Test mechanisms to restrict Sugar Gliders from Swift Parrot nest hollows						

4.3.	Trial methods to reduce Sugar Glider density from key breeding areas	
4.4	Better understand extinction/ colonisation dynamics of Sugar Gliders	
4.5	Further investigate the link between forest condition and predation rates	
4.6	Develop communication strategy specific to Sugar Glider management	
4.7	Reduction of Sugar Glider predation rates on Swift Parrots over the breeding season.	
4.8	Early detection, and control, of Sugar Glider introduction to islands	
4.9	Regulatory reform of Sugar Glider protected wildlife status	Core government business
6.1	Develop and implement a broad strategy to raise awareness and educate the general public about Swift Parrot conservation.	
7.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on the recovery outcomes.	
	Total	

10 Effects on other native species and biodiversity

The Swift Parrot has become a 'flagship' species for conservation issues across eastern Australian, in particular in the Tasmanian southern forests. Enhanced protection of these forests will also help many other listed threatened bird species. In Tasmania, this includes the Masked Owl (*Tyto novaehollandiae castanops*), Wedge-tailed Eagle (*Aquila audax fleayi*), Forty Spotted Pardalote (*Pardalotus quadragintus*); and on the mainland includes species such as the Regent Honeyeater (*Anthochaera phrygia*), Red-tailed Black Cockatoo (*Calyptorhyncus banksii graptogyne*) and the Superb Parrot (*Polytelis swainonii*). Many other mammals, invertebrates and plants will also receive benefits due to measures put in place to protect and rejuvenate Swift Parrot habitat.

Threatened Ecological Communities listed under the EPBC Act that are of importance to the Swift Parrot includes: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Cumberland Plain Woodland, Shale Sandstone Transition Forests, Shale Gravel Transition Forests, Gippsland Red Gum Grassy Woodland and Associated Native Grassland and Grassy Eucalypt Woodland of the Victorian Volcanic Plain. There are also a number of Ecological Communities listed at the state level that will benefit from increased efforts to protect and conserve Swift Parrot habitat.

11 Social and economic considerations

The major economic impact of this recovery plan will be on those who require approval to remove or modify Swift Parrot habitat and are prevented from doing so, or are required to modify their proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to provide offset funding ~~for research~~, to secure or rehabilitate habitat, or for other threat mitigation work. ~~Any further loss of forest and woodland habitat from areas known or likely to contain Swift Parrots is regarded as significant.~~

~~Swift parrot habitat has been modified through forestry operations, clearing, development, fragmentation and degradation. The more fertile areas not used for commercial forestry~~

~~operations have been targeted for agricultural pursuits.~~ Restrictions on further clearing of Swift Parrot habitat will impact on some landowners/managers and developers. These restrictions ~~are~~ may not ~~predicted to impact~~ significantly impact on agricultural cropping industries since many of the more fertile areas have already been cleared and the ~~remnants of these~~remaining forest communities are generally located on less fertile soils and are, therefore, relatively less ~~un~~attractive for ~~grazing or~~ cropping.

~~Public and private forestry harvesting operations remain a significant threat to the Swift Parrot. The retention of nesting areas and a suitable number of large mature trees for nectar production and to provide foraging habitat is required.~~ Application of ~~suitable~~ prescriptions protecting Swift Parrot habitat in areas managed for forestry throughout the range of the Swift Parrot ~~may~~ will reduce the volume of timber available for harvesting. The management of forestry operations is carried out under the provisions of the Regional Forest Agreements, with the management prescriptions being developed and implemented by State Governments and the associated forestry managers.

The Swift Parrot is a charismatic species whose plight raises awareness of the conservation problems faced by a diversity of threatened species. A large network of community volunteers across eastern Australia actively participate in Birdlife Australia coordinated annual surveys for the species. By conducting surveys in their local area, undertaking habitat restoration projects and attending educational workshops each year. Such involvement provides social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of indigenous cultural values.

12 Affected interests

Organisations likely to be affected by the actions proposed in this plan include Australian and State Government agencies, particularly those with environmental, agricultural and land planning concerns; the forestry and agricultural sectors; researchers; and conservation groups. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery process.

13 Consultation

The National Recovery Plan for the Swift Parrot has been developed through extensive consultation with a broad range of stakeholders. The consultation process included a workshop in Melbourne that brought together key species experts and conservation managers from a range of different organizations, to categorize ongoing threats to the Swift Parrot and to identify knowledge gaps and potential management options. Workshop invitees included representatives from the Commonwealth Government and from the Tasmanian, New South Wales and Victorian Governments; BirdLife Australia; Sustainable Timber Tasmania, the Tasmanian Forest Practices Authority and researchers from university sector. The Recovery Team has also had several opportunities to comment on the draft plan.

14 Evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publically available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged or is varied to remove completed actions and include new conservation priorities
- whether a recovery plan is no longer necessary for the species because either a Conservation Advice will suffice, or the species is removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department of the Environment and Energy in association with relevant Australian and State Government agencies and key stakeholder groups such as non-governmental organisations, local community groups, scientific research organisations and individual experts.

Australian Government
Department of the Environment

State/territory governments
Victoria – Department of Environment, Land, Water and Planning and Parks Victoria
New South Wales – Office of Environment and Heritage; Forestry Corporation of NSW
Queensland – Department of Environment and Heritage Protection
South Australia – Department for Environment, Water and Natural Resources
Tasmania - DPIPWE
Australian Capital Territory – ACT Parks Conservation and Lands
Natural resource management bodies
Local government

Non-government organisations
BirdLife Australia
Conservation groups
Universities and other research organisations

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