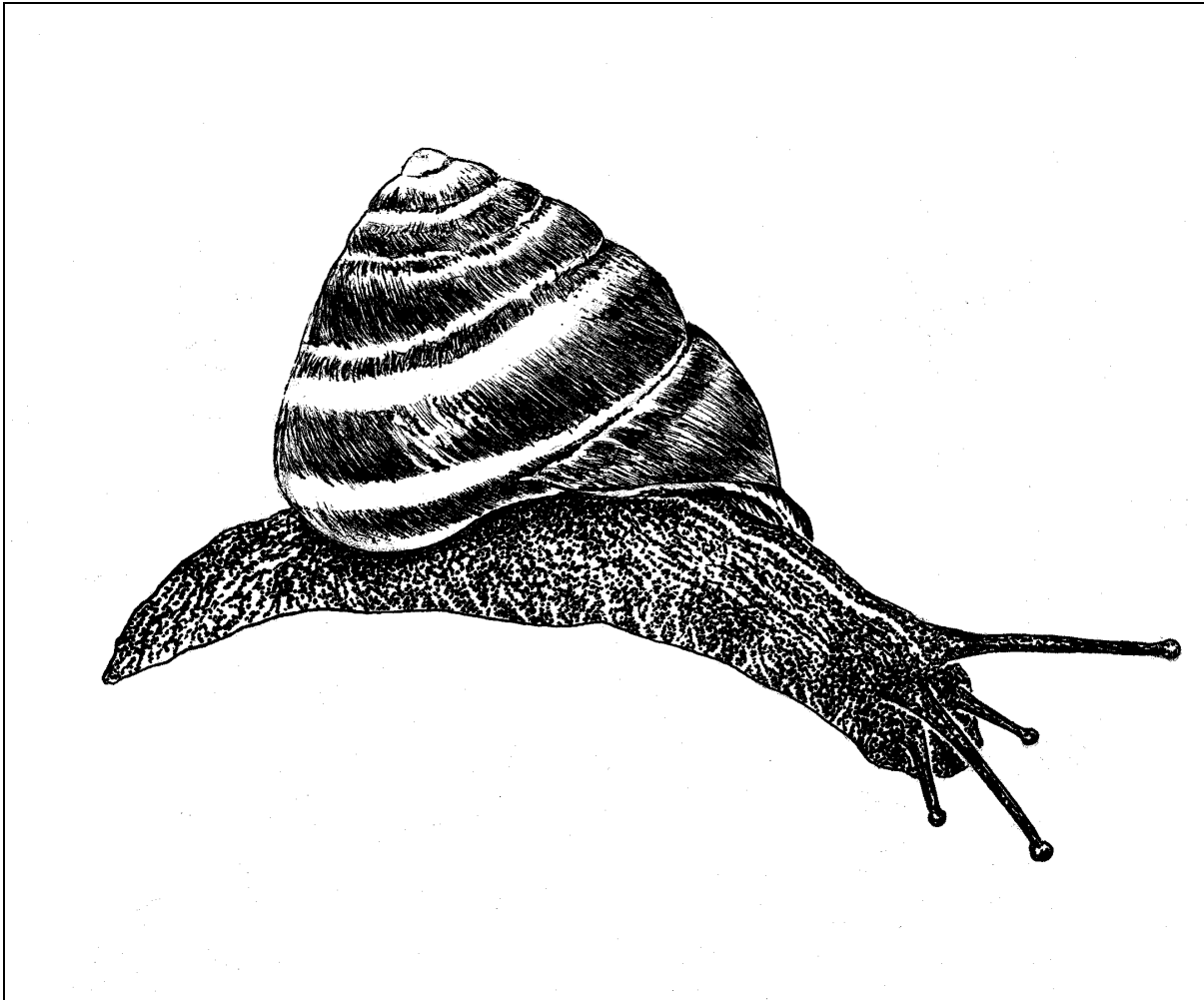


Mitchell's Rainforest Snail

Thersites mitchellae (Cox, 1864)

Recovery Plan



July 2001

NSW
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Mitchell's Rainforest Snail Recovery Plan

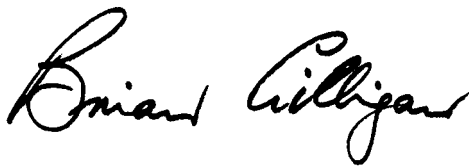
Foreword

The conservation of threatened species, populations and ecological communities is crucial for the maintenance of this State's unique biodiversity. In NSW, the *Threatened Species Conservation Act 1995* (TSC Act) provides the framework to conserve and recover threatened species, populations and ecological communities through the preparation and implementation of recovery plans.

The preparation and implementation of recovery plans is identified by both the National Strategy for the Conservation of Australia's Biological Diversity and the draft NSW Biodiversity Strategy as a key strategy for the conservation of threatened flora and fauna. The object of a recovery plan is to document the research and management actions required to promote the recovery of a threatened species, population or ecological community and to ensure its ongoing viability in nature.

The TSC Act requires that the Director-General of National Parks and Wildlife prepare recovery plans for all species, populations and ecological communities listed as endangered or vulnerable on the TSC Act schedules. The TSC Act includes specific requirements for both the matters to be addressed by recovery plans and the process for preparing recovery plans. This plan satisfies these provisions.

This recovery plan describes our current understanding of Mitchell's Rainforest Snail, documents the research and management actions undertaken to date, and identifies the actions required and parties responsible in addressing the conservation of the species in the wild.



Brian Gilligan
Director-General



Bob Debus MP
Minister for the Environment

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1.0 Introduction

Mitchell's Rainforest Snail *Thersites mitchellae* is a large terrestrial snail found only in remnant lowland rainforest and swamp forest areas on the NSW far north coast. Its status has declined from common to extremely rare and it is now listed as an endangered species under Schedule 1 of the TSC Act. The aim of this recovery plan is to identify and protect the remaining habitat and extant populations of the species and to encourage community involvement in the conservation and recovery of the species.

2.0 Description and distribution

The genus *Thersites* (Family Camaenidae Subfamily Camaeninae) is a group of large land snails inhabiting rainforests in north-east NSW and south-east Queensland (Bishop 1978). Three species are currently recognised: *Thersites mitchellae* (Cox, 1864) from lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey between the Richmond and Tweed Rivers in north-east NSW, *Thersites novaehollandiae* (Gray, 1834) from temperate and subtropical rainforest from Barrington Tops to the NSW/Queensland border and *Thersites richmondiana* (Reeve, 1852) from upland temperate and subtropical rainforest between the McPherson Range on the NSW/Queensland border and the Conondale Range in south-east Queensland (Bishop 1978; Stanisc 1999).

Mitchell's Rainforest Snail has a large shell up to 55 mm wide and 50 mm high, with a strongly elevated spire giving it a triangular profile, and a thickened, reflected lip. The shell is deep reddish chestnut to black in colour with two prominent yellow bands, and has a very fine microsculpture which gives it a satin appearance when held in bright light. The body colour is black with a thin lighter line on the dorsal midline.

The current range of Mitchell's Rainforest Snail remains approximately the same as its historical distribution, the coastal plain between the Richmond and Tweed Rivers. Within this range, however, land clearing has been extensive and Mitchell's Rainforest Snail is now restricted to remnant areas of habitat.

Recent sites are distributed along the coastal plain between Banora Point in the north and Lennox Head in the south (Fig. 1). The largest known population of Mitchell's Rainforest Snail and largest remaining single area of suitable habitat is in Stotts

Island Nature Reserve in the Tweed River near Murwillumbah (Stanisc 2000). A complex of smaller populations and habitat fragments has also been identified in remnant areas around Cumbebin Wetland at Byron Bay (Fig. 1).

Mitchell's Rainforest Snail was recorded at a site at Wilsons River near Mullumbimby in 1980 (Stanisc 1999) (Fig. 1). The Wilsons River site (elevation 230 m AHD) is outside the normal range of the species and the other snail species present there, including *Ngairea corticicola*, *Thersites richmondiana* and *Pedinogyra rotabilis*, are indicative of an upland snail fauna assemblage rather than the lowland snail fauna assemblage usually associated with Mitchell's Rainforest Snail (Stanisc 1999). Mitchell's Rainforest Snail was not found during a targeted search of the Wilsons River site in 1999 and the original record there is suspected of being the result of accidental translocation (Stanisc 1999).

3.0 Current conservation status

Judging from collections of the species last century, Mitchell's Rainforest Snail was previously common within its range but has since declined in abundance (Australian Museum 2001). The species has been listed as endangered (category ENC2a) on the IUCN Red List (International Union for the Conservation of Nature 1997).

Between 1955 and 1995 Mitchell's Rainforest Snail was recorded at only two sites, Stotts Island and Wilsons River (Stanisc 1998). Additional coastal plain sites supporting Mitchell's Rainforest Snail have been recorded since 1996, reflecting an increased level of survey as well as increased community awareness.

Many of the recent sites are considered marginal, having only a small area of habitat and populations represented by three or less known specimens of Mitchell's Rainforest Snail (Stanisc 1998). In contrast, the population status at Stotts Island is considered good, with approximately 120 hectares of lowland subtropical rainforest present (Floyd 1990) and an estimated Mitchell's Rainforest Snail population of several hundred snails (Stanisc 2000).

4.0 Habitat and ecology

Mitchell's Rainforest Snail is restricted to lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey, typically on alluvial soils with a basaltic influence. It is apparently absent

from other rainforest types in the area, such as littoral rainforest (Stanisic 1998). This type of correlation with particular rainforest communities is common in many land snail species in eastern Australia (Stanisic 1994).

Lowland rainforest and swamp sclerophyll forest in the Tweed-Richmond area has been extensively cleared for agriculture and urban development and now occurs only in small remnants. Most of the sites where the species is known to survive are located on slightly elevated ground on the margins of coastal wetlands. This may be an artefact of land clearing patterns or indicate a real microhabitat preference. Breeding populations of Mitchell's Rainforest Snail can persist in narrow strips of remnant rainforest (Stanisic 1998), although the longer-term viability of populations at such sites is uncertain.

Little information is available on the ecology of Mitchell's Rainforest Snail. Its restriction to rainforest and swamp forest, a trait shared with 90% of eastern Australian land snail species (Stanisic 1994), suggests a dependence on high moisture levels, low fire frequency and a well developed leaf litter layer. Microhabitat data for Mitchell's Rainforest Snail includes records of live animals found by day sheltering under palm fronds on the ground, inside dead palm frond stems, under leaf litter at the base of trees, and under bark in fig *Ficus* trees (Stanisic 1998), and active at night on the surface of leaf litter (Stanisic 2000; Murphy pers. obs.). Stanisic (1998) concluded that Mitchell's Rainforest Snail is probably terrestrial and that juveniles are possibly arboreal. The related *Thersites novaehollandiae* is active at night, foraging on the rainforest floor and up to six metres high on tree trunks, and is most obviously active on warm, wet nights (Murphy pers. obs.).

Mitchell's Rainforest Snail is herbivorous and is thought to feed on leaf litter, fungus and lichen (Stanisic 2000). Breeding behaviour has only been observed once, with a clutch of 70 small, round, white eggs laid below the surface of leaf litter in November (Murphy pers. obs.).

Key habitat components for Mitchell's Rainforest Snail are a well-developed leaf litter layer (providing food, shelter and breeding sites) and an intact forest canopy (maintaining a moist microclimate and providing a source of leaf litter).

5.0 Relevant legislation

Mitchell's Rainforest Snail is listed as an endangered species on Schedule 1, Part 1 of the TSC Act. The species is not currently listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). This plan proposes nomination of the species for listing under the Commonwealth EPBC Act.

6.0 Recovery Plan implementation

The TSC Act requires that a government agency must not undertake actions inconsistent with a recovery plan. The NPWS is the authority responsible for the actions identified in this plan.

6.1 Critical habitat

The TSC Act makes provision for the identification and declaration of critical habitat for species, populations and ecological communities listed as endangered. Once declared, it becomes an offence to damage critical habitat (unless the action is specifically exempted by the TSC Act) and a species impact statement is mandatory for all developments and activities proposed within critical habitat.

This plan proposes declaration of habitat in Stotts Island Nature Reserve as critical habitat for Mitchell's Rainforest Snail. This will be one of the first critical habitat declarations in NSW and will contribute significantly to the recovery of Mitchell's Rainforest Snail and its habitat. It will also greatly assist implementation of the TSC Act's critical habitat provisions across a range of endangered species and land tenures by increasing community awareness of these provisions and by establishing an administrative process to be followed.

Declaration of critical habitat for Mitchell's Rainforest Snail in Stotts Island Nature Reserve does not indicate that additional areas are not essential or critical to the recovery of the species. An action has been included in this plan requiring consideration of additional areas for identification as critical habitat for the species. This may include the complex of habitat fragments in the Cumbebin Wetland area at Byron Bay.

6.2 Environmental assessment

The TSC Act amendments to the environmental assessment provisions of the *Environmental Planning and Assessment Act* 1979 (EPA Act) require that consent and determining authorities consider relevant recovery plans when exercising a decision-

making function under Parts 4 & 5 of the EPA Act. Consent and determining authorities must consider the conservation strategy outlined in this plan when considering a proposed development or activity that may affect the species.

This plan also includes environmental impact assessment guidelines to assist those required to prepare or review assessments of likely impacts on Mitchell's Rainforest Snail (Appendix 1).

7.0 Management issues

7.1 Threats and reasons for decline

The major cause of the decline of Mitchell's Rainforest Snail is habitat destruction (Stanisic 1998; Stanisic 2000). Land clearing for agriculture and urban development across the species' range has been extensive, and many of the small areas of surviving habitat remain at risk of clearing and development. The habitat value of small remnants is typically judged from a large vertebrate-focussed perspective, and the conservation value of these sites for invertebrate species is often not appreciated (Ponder 1997).

The majority of known remaining populations occurs in small areas of remnant rainforest including narrow strips of rainforest bordering coastal wetlands. These small remnant areas, with a high perimeter to area ratio, are at risk from edge effects, including desiccation, habitat disturbance, frequent fire and invasion by exotic weeds and feral animals. There is little data available on the impact of these factors on land snails (Ponder 1997), but they are likely to be adverse.

Predation by birds and introduced mammals has been identified as a possible threat to Mitchell's Rainforest Snail (NSW Scientific Committee 1997; Australian Museum 2001). Mitchell's Rainforest Snail is preyed upon by the Noisy Pitta *Pitta versicolor* in Stotts Island Nature Reserve (Stanisic 2000). Introduced rats feed on land snails (Sherley *et al.* 1998; Ponder and Chapman 1999), and may prey on Mitchell's Rainforest Snail.

7.2 Social and economic consequences

This recovery plan recommends consideration of potential impacts on Mitchell's Rainforest Snail by consent and determining authorities considering proposed developments and activities in areas of known or potential habitat of the species.

Implementation of protection and management measures identified in this recovery plan would include local community involvement, and may have a positive flow-on with economic benefits to the community.

Funding for implementation of actions would need to be allocated. Estimated costing for the implementation of recovery actions over the five years of the plan is provided in Table 2. Implementation has been costed at \$56 000 (priority 1), \$72 500 (priorities 1 and 2) and \$79 500 (priorities 1, 2 and 3).

7.3 Biodiversity benefits

On a global scale, the number of threatened terrestrial and freshwater mollusc species is greater than any other taxonomic group, exceeding by far, for example, the combined bird and mammal species listed (Ponder 1997). Despite this, mollusc conservation, and indeed invertebrate conservation in general, has not had a high profile. The profile of threatened invertebrate species, and of invertebrate conservation in general, will be raised in the community through awareness of the status of Mitchell's Rainforest Snail. This in turn will lead to greater opportunities for the conservation of threatened species and increased protection of biodiversity.

Actions to recover Mitchell's Rainforest Snail will assist in the conservation of other species that share its lowland rainforest habitat.

Land snails in eastern Australia are good indicators of climatic refugia for rainforest (Stanisic 1994), and hence species like Mitchell's Rainforest Snail are potentially of significant value in assisting reserve design to ensure longer-term biodiversity conservation.

8.0 Previous actions undertaken

8.1 Listing under TSC Act

Mitchell's Rainforest Snail was listed as endangered under the TSC Act in March 1997 (NSW Scientific Committee 1997), and was one of the first invertebrate species to be listed. Lowland rainforest on floodplain in the NSW North Coast bioregion, including the habitat of Mitchell's Rainforest Snail, was listed as an endangered ecological community under the TSC Act in August 1999 (NSW Scientific Committee 1999).

8.2 Survey and research

Targeted surveys for Mitchell's Rainforest Snail in 1998 and 1999 (Stanisic 1998; Stanisic 1999) were funded by the NSW National Parks and Wildlife Service (NPWS). These surveys recorded Mitchell's Rainforest Snail at four sites, three of which were new localities for the species, and provided valuable information concerning the species' habitat requirements.

A survey for the species on Stotts Island in 1999 (Stanisic 2000) was jointly funded by the NPWS and Queensland Museum. This study provided information on the distribution and status of the species on Stotts Island, identified potential threats to the population and provided recommendations for management.

8.3 Habitat identification and protection

Byron and Tweed Shire Councils have recently completed shire-wide vegetation mapping projects, including mapping of lowland subtropical rainforest and swamp sclerophyll forest remnants. This information will assist with implementation of recovery action 8 listed in this plan.

The significant area of known habitat for Mitchell's Rainforest Snail at Stotts Island is protected in Stotts Island Nature Reserve. Some additional areas of known habitat and potential habitat are afforded a level of protection through being within or in proximity to wetland areas identified under State Environmental Planning Policy (SEPP) No. 14 (Coastal Wetlands) and/or within environmental protection zones under the relevant Local Environmental Plans. SEPP No. 14 Coastal Wetlands of relevance or potential relevance comprise those between the Tweed and Richmond Rivers in northern NSW. Specific SEPP No. 14 Coastal Wetlands currently known to contain or be in close proximity to extant populations of Mitchell's Rainforest Snail are Wetland numbers 24 (Banora Point), 79, 80a and 81 (Byron Bay) and 87 (Lennox Head). It is anticipated that populations of Mitchell's Rainforest Snail or areas of potential habitat will be found within or near additional SEPP No. 14 Coastal Wetlands through habitat mapping, scientific surveys and community awareness as outlined in this recovery plan.

8.4 Community awareness

The NPWS has raised the public profile of Mitchell's Rainforest Snail during 2000/2001 through regional, state and national media

including television, radio, newspaper and popular magazines.

The Foundation for National Parks and Wildlife included Mitchell's Rainforest Snail as one of six feature species in its 2000 Threatened Species Appeal.

The NPWS has prepared a community awareness brochure (Appendix 2) detailing where Mitchell's Rainforest Snail lives and how to identify it, the threats to its survival, and how the community can assist in its conservation and recovery. This brochure has been widely distributed in the Tweed/Byron/Ballina area through local NPWS offices, local Councils, and Landcare and other community organisations.

The NPWS and Tweed Shire Council have prepared new interpretive display material for the public visitation facilities at Bruce Chick Park, adjacent to Stotts Island Nature Reserve, in accordance with the plan of management for Stotts Island (NPWS 2001). The new display features information on Mitchell's Rainforest Snail and promotes community awareness of the significance of Stotts Island for the conservation of the species.

The Australian Museum provides information on Mitchell's Rainforest Snail and other threatened land snails to the general public on its invertebrate zoology internet web site (Australian Museum 2001).

9.0 Species' ability to recover

Given the current information base available, the ability of the species to recover is unknown. The apparent ability of the species to persist as breeding populations in small remnants (Stanisic 1998) suggests a positive conservation potential. However, the species' long-term recovery will also depend on conservation and recovery of its lowland subtropical rainforest and swamp forest habitat.

10.0 Recovery objectives

The overall objective of this recovery plan is to promote the recovery of Mitchell's Rainforest Snail in the wild. Specific objectives for the first five years of this recovery plan are listed below.

- Objective 1: to assist identification of potential habitat for Mitchell's Rainforest Snail.
- Objective 2: to assist identification of additional populations of Mitchell's Rainforest Snail.

- Objective 3: to maximise the protection of the population of Mitchell's Rainforest Snail on Stotts Island.
- Objective 4: to improve the protection and management of other populations of Mitchell's Rainforest Snail and remaining areas of habitat.
- Objective 5: to encourage community participation in the recovery of Mitchell's Rainforest Snail.

11.0 Recovery performance criteria

Recovery performance criteria are listed below.

- Criterion 1: areas of potential habitat for Mitchell's Rainforest Snail are identified.
- Criterion 2: the identification of additional populations of Mitchell's Rainforest Snail through scientific survey and community awareness is supported.
- Criterion 3: the population of Mitchell's Rainforest Snail in Stotts Island Nature Reserve is conserved and maintained as a viable population.
- Criterion 4: the protection and management of other populations are improved.
- Criterion 5: community awareness of the status of Mitchell's Rainforest Snail, and community participation in its recovery, are increased.

12.0 Recovery actions

Recovery actions to be undertaken over the next five years to achieve the identified specific recovery objectives are listed below. Linkages with specific objectives and performance criteria are identified for each action.

12.1 Survey and research

1. Scientific survey of areas of high potential habitat for Mitchell's Rainforest Snail on the coastal plain to identify additional populations. (*Objective 2/Performance criterion 2*).
2. Scientific survey of Wilsons River area and other foothills localities to investigate whether distribution of Mitchell's Rainforest Snail extends outside the coastal plain. (*Objective 2/Performance criterion 2*).
3. Research into the ecology and lifecycle of Mitchell's Rainforest Snail relevant to the conservation of the species is supported. This will include support for research into the potential impacts on

Mitchell's Rainforest Snail of predation by the introduced Black Rat *Rattus rattus*. (*Objectives 1-4/Performance criteria 1-4*).

4. Long-term monitoring every second year established at selected Mitchell's Rainforest Snail sites to identify any changes in the status of the species. (*Objectives 3 and 4/Performance criteria 3 and 4*).
5. Genetics research undertaken to examine the level of variation within and between populations of Mitchell's Rainforest Snail. This will provide important information on the effects of fragmentation, inbreeding and other data relevant to the management and recovery of the species. (*Objectives 3 and 4/Performance criteria 3 and 4*).
6. Research and field survey projects involving Mitchell's Rainforest Snail requiring licensing under the TSC Act will be required to observe the guidelines provided in Appendix 3, to ensure that the work undertaken does not further threaten the survival of Mitchell's Rainforest Snail or a population of the species. (*Objectives 3 and 4/Performance criteria 3 and 4*).

Outcome

Increased knowledge of current distribution of habitat and populations of Mitchell's Rainforest Snail, monitoring of species' status and collection of additional information to assist in the conservation and management of the species. Note: Actions 1 to 5 may be undertaken in coordination as a single project.

12.2 Protection of extant populations and habitat

7. State and local government authorities and community groups with responsibilities relevant to the protection of Mitchell's Rainforest Snail and its habitat will be made aware and kept informed by the NPWS of the species' conservation requirements and the location of known populations and potential habitat. Relevant authorities are identified in Table 3. (*Objective 4/Performance criterion 4*).
8. NPWS will work in cooperation with Tweed, Byron and Ballina Shire Councils to produce maps showing areas of potential habitat for Mitchell's Rainforest Snail to assist with land management and environmental planning and assessment matters. Map derivation

is to include occurrence of lowland floodplain rainforest and swamp sclerophyll forest remnants, coastal wetlands, basaltic-derived alluvium, and recent records and historical distribution of Mitchell's Rainforest Snail. (*Objectives 1, 2 and 4/Performance criteria 1, 2 and 4*).

9. It is unlikely that the above mapping will identify all areas of potential habitat, particularly small areas of habitat. Recommendation will be made by the NPWS that identified potential habitat (action 8 above), all lowland rainforest and swamp sclerophyll forest remnants and vegetated areas within 50 m of SEPP No. 14 Coastal Wetlands in Tweed, Byron and Ballina Shires be protected from clearing or development in the relevant Local Environmental Plans and Regional Vegetation Management Plans. (*Objectives 1 and 4/Performance criteria 1 and 4*).
10. Identification and declaration of habitat for Mitchell's Rainforest Snail in Stotts Island Nature Reserve as critical habitat under the TSC Act. (*Objective 3/Performance criterion 3*).
11. Assessment of areas of habitat for Mitchell's Rainforest Snail additional to Stotts Island for identification as critical habitat under the TSC Act. (*Objectives 4 and 5/Performance criteria 4 and 5*).
12. Implementation of management measures as appropriate to control identified threats to Mitchell's Rainforest Snail in Stotts Island Nature Reserve and maintain viability of the population. (*Objective 3/Performance criterion 3*).
13. NPWS will support weed control work in lowland rainforest and swamp sclerophyll forest remnants on basaltic soils in the Tweed, Byron and Ballina Shires, and will recommend that such weed control work be undertaken in a manner which minimises disturbance to the habitat of Mitchell's Rainforest Snail, including maintaining a moist microclimate and minimising disturbance to the leaf litter layer and fallen logs. (*Objectives 4 and 5/Performance criteria 4 and 5*).

Outcome

Increased protection of extant populations and habitat and conservation of other biodiversity elements that share lowland rainforests with Mitchell's Rainforest Snail.

12.3 Commonwealth listing

14. Nomination of Mitchell's Rainforest Snail as an endangered species under the Commonwealth EPBC Act. (*Objectives 3-5/Performance criteria 3-5*).

Outcome

Recognition at national level of the conservation status of the species.

12.4 Community awareness and involvement

15. Preparation and distribution of a community awareness brochure with the following components:
 - promoting Mitchell's Rainforest Snail as a flagship for invertebrate conservation, to raise the profile of invertebrate conservation issues in the general community,
 - providing information concerning the status, identification and habitat of Mitchell's Rainforest Snail, threats to the species and how the community can assist in its recovery, and
 - providing information regarding the value and management of small lowland rainforest remnants in the Tweed, Byron and Ballina Shires as potential habitat for Mitchell's Rainforest Snail and other species. (*Objectives 1, 2, 4 and 5/Performance criteria 1, 2, 4 and 5*).
16. Preparation and distribution of a school teacher's kit in cooperation with the Department of Education and Training, targeting schools in the Tweed, Byron and Ballina Shires. The kit is to provide information concerning Mitchell's Rainforest Snail and other local native land snails to promote awareness of invertebrate conservation and the value of small urban habitat areas and is to be designed to be used in relation to relevant school syllabus topics in a local context. (*Objectives 2, 4 and 5/Performance criteria 2, 4 and 5*).
17. High profile media publicity concerning Mitchell's Rainforest Snail and its conservation and recovery will be sought over the life of the recovery plan. (*Objectives 1, 2, 4 and 5/Performance criteria 1, 2, 4 and 5*).
18. NPWS will support appropriate community-based initiatives to develop interpretive material to promote community awareness of the status of Mitchell's Rainforest Snail with components similar to those listed for action 15 above. This is to include

appropriate initiatives in the Cumbebin Wetland area at Byron Bay. (*Objectives 1, 2, 4 and 5/Performance criteria 1, 2, 4 and 5*).

19. NPWS will liaise with the Australian Museum on a minimum six monthly basis to assist the Museum in maintaining up to date information concerning Mitchell's Rainforest Snail on the Museum's invertebrate zoology internet web site. (*Objectives 1, 2, 4 and 5/Performance criteria 1, 2, 4 and 5*).

Outcome

Increased community awareness of Mitchell's Rainforest Snail and community involvement in its conservation and recovery, and increased community awareness of broader invertebrate conservation issues.

13.0 Implementation

Table 1 identifies the priority and timeframes for the implementation of recovery actions specified in this plan for a period of five years from the time this recovery plan is adopted. The NPWS is the agency responsible for implementation of identified actions.

14.0 Preparation details

This document was prepared by Michael Murphy, Senior Threatened Species Officer, NPWS Northern Directorate. Background information and assistance was provided by Dr John Stanisic (Queensland Museum).

15.0 Review date

This recovery plan will be reviewed within five years of the date of publication.

16.0 References

Australian Museum (2001). *Threatened and Endangered Landsnail species*. Australian Museum Invertebrate Zoology Internet site <<http://www.austmus.gov.au/science/division/invert/mal/endangered.htm>>.

Bishop, M. J. (1978). A revision of the genus *Thersites* Pfeiffer (Pulmonata: Camaenidae). *J. Malac. Soc. Aust.* 4(1-2): 9-21.

Floyd, A. (1990). *Australian Rainforests in New South Wales*. Volume II. Surrey Beatty & Sons Pty Ltd, Chipping Norton, NSW.

International Union for the Conservation of Nature (1997). IUCN Red List. IUCN Species Survival Commission, Gland, Switzerland.

NSW National Parks and Wildlife Service (2001). *Stotts Island Nature Reserve Plan of Management*. NPWS, Hurstville, NSW.

NSW Scientific Committee (1997). Final determination to list *Thersites mitchellae* as an endangered species on Schedule 1, Part 1 of the *Threatened Species Conservation Act* 1995.

NSW Scientific Committee (1999). Final determination to list Lowland Rainforest on Floodplain in the NSW North Coast Bioregion as an endangered ecological community on Schedule 1, Part 3 of the *Threatened Species Conservation Act* 1995.

Ponder, W. (1997). Conservation status, threats and habitat requirements of Australian terrestrial and freshwater Mollusca. *Memoirs of the Museum of Victoria* 56(2): 421-430.

Ponder, W. and Chapman, R. (1999). Survey of the land snail *Placostylus bivaricosus* on Lord Howe Island. Unpublished report prepared for NSW National Parks and Wildlife Service.

Sherley, G. H., Stringer, I. A. N., Parrish, G.R. and Flux, I. (1998). Demography of two landsnail populations (*Placostylus ambagiosus*, Pulmonata: Bulimulidae) in relation to predator control in the far north of New Zealand. *Biological Conservation* 84: 83-88.

Stanisic, J. (1994). The distribution and patterns of species diversity of land snails in eastern Australia. *Memoirs of the Queensland Museum* 36(1): 207-214.

Stanisic, J. (1998). Survey for Land Snail *Thersites mitchellae* in Northern New South Wales. Unpublished report prepared for NSW National Parks and Wildlife Service.

Stanisic, J. (1999). Survey for Land Snail *Thersites mitchellae* in Northern New South Wales. II. Investigation of Wilsons Creek Locality. Unpublished report prepared for NSW National Parks and Wildlife Service.

Stanisic, J. (2000). Survey for Land Snail *Thersites mitchellae* in Northern New South Wales. III. Investigation of Stotts Island locality. Unpublished report prepared for NSW National Parks and Wildlife Service.

■

17.0 Implementation Tables

Table 1. Responsibility for implementation, timing and priority of recovery actions. Priority is categorised as 1 (essential), 2 (highly desirable) or 3 (desirable).

Recovery action	Responsibility for implementation	Timeframe	Priority
12.1 Survey and research			
Action 1: survey on coastal plain	NPWS	Years 2 and 3	1
Action 2: survey of foothills areas	NPWS	Year 2	1
Action 3: research into ecology	NPWS	Years 1 and 2	1
Action 4: monitoring of populations	NPWS	Years 1, 3 and 5	2
Action 5: genetics research	NPWS	Year 4	3
Action 6: survey/research guidelines	NPWS	Life of plan	3
12.2 Protect populations and habitat			
Action 7: advice to other agencies	NPWS	Life of plan	1
Action 8: map potential habitat	NPWS	Year 1	1
Action 9: habitat protection	NPWS	Life of plan	1
Action 10: critical habitat Stotts Island	NPWS	Year 1	1
Action 11: additional critical habitat	NPWS	Year 4	1
Action 12: Stotts Island management	NPWS	Life of plan	1
Action 13: weed control work	NPWS	Life of plan	2
12.3 Commonwealth listing			
Action 14: nomination under EPBC Act	NPWS	Year 1	2
12.4 Community awareness			
Action 15: community brochure	NPWS	Years 1 and 4	1
Action 16: teacher's kit	NPWS	Year 1	1
Action 17: media	NPWS	Life of plan	1
Action 18: community initiatives	NPWS	Year 1, 3 and 5	2
Action 19: Museum internet web site	NPWS	Life of plan	2

Table 2. Estimated costs of implementing recovery actions. Costed actions are subject to funding availability unless noted as funding secured. Estimates do not include Goods and Services Tax.

Recovery action	Year of implementation					Total
	1	2	3	4	5	
Survey and research						
Action 1: survey coastal plain	-	7500	7500	-	-	* • \$15 000
Action 2: survey of foothills	-	7500	-	-	-	* • \$7 500
Action 3: research into ecology	6000	4000	-	-	-	* • \$10 000
Action 4: monitoring	5000	-	5000	-	5000	* • \$15 000
Action 5: genetics research	-	-	-	7000	-	* • \$7 000
Action 6: survey/research guidelines	ψ	ψ	ψ	ψ	ψ	-
Protect populations and habitat						
Action 7: advice to agencies	ψ	ψ	ψ	ψ	ψ	-
Action 8: map potential habitat	6000	-	-	-	-	* \$6 000
Action 9: habitat protection	ψ	ψ	ψ	ψ	ψ	-
Action 10: critical habitat Stotts Island	ψ	-	-	-	-	-
Action 11: additional critical habitat	-	-	-	3000	-	* \$3 000
Action 12: Stotts Is. Management	2000	1500	1500	1500	1500	* \$8 000
Action 13: weed control work	ψ	ψ	ψ	ψ	ψ	-
Commonwealth listing						
Action 14: EPBC Act nomination	ψ	-	-	-	-	-
Community awareness						
Action 15: community brochure	¹ 1000	-	-	* 1500	-	\$2 500
Action 16: teacher's kit	4000	-	-	-	-	* \$4000
Action 17: media	ψ	ψ	ψ	ψ	ψ	-
Action 18: community initiatives	500	-	500	-	500	* \$1 500
Action 19: Museum internet web site	ψ	ψ	ψ	ψ	ψ	-
Annual costs of implementing plan	24 500	20 500	14 500	13 000	7000	\$79 500
Total cost of recovery plan						\$79 500

ψ Costs covered by NPWS core duties

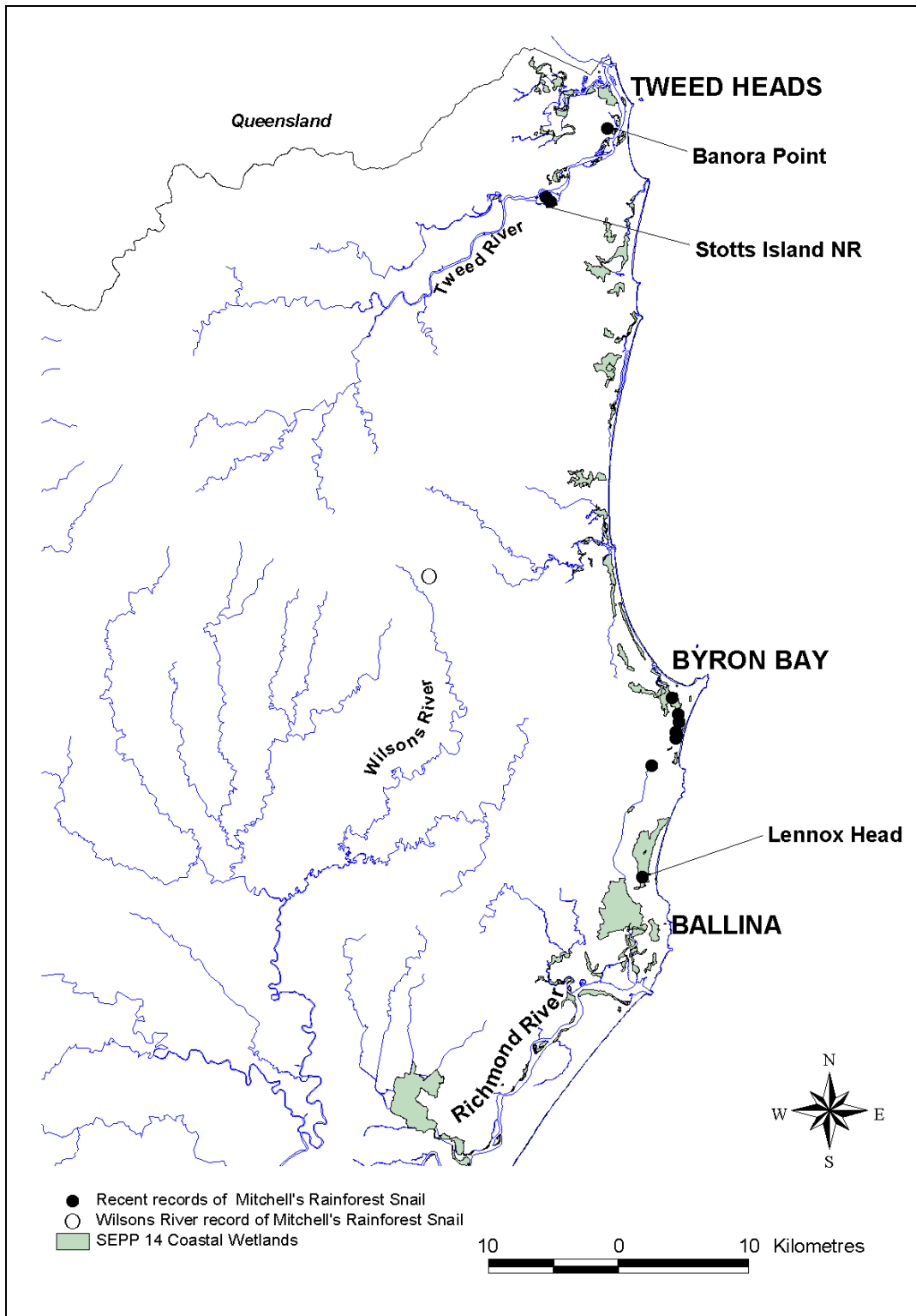
* Subject to availability of funding.

¹ Costs secured from NPWS 1999/2000 recurrent recovery planning funding.

• NPWS to seek to undertake action as cooperative project with research or educational institution with appropriate expertise.

Table 3. Public authorities and community groups with responsibilities relevant to the protection of Mitchell's Rainforest Snail and its habitat (apart from NPWS).

Organisation	Relevant responsibilities
Tweed, Byron and Ballina Shire Councils	<ul style="list-style-type: none"> • Preparation of Local Environmental Plans under Part 3 of EPA Act. • Consent authorities for development proposals under Part 4 of EPA Act. • Approval authorities for Council works under Part 5 of EPA Act. • Responsibilities under <i>Rural Fires Act 1997</i>. • Management of Council reserves with potential habitat.
Department of Land and Water Conservation	<ul style="list-style-type: none"> • Approval authority for native vegetation clearance applications under <i>Native Vegetation Conservation Act 1997</i>. • Management of Crown land with potential habitat. • Coordination of Regional Vegetation Committees, total catchment management and Landcare programs.
Department of Urban Affairs and Planning	<ul style="list-style-type: none"> • Development of policy and strategies for land-use planning and environmental assessment. • Advice and assistance on environmental planning matters. • Assessment of major development applications. • Assessment and approval of developments in SEPP No. 14 Coastal Wetlands.
State Government authorities	<ul style="list-style-type: none"> • Management of public lands with potential habitat. • Approval authorities for activity proposals under Part 5 of EPA Act.
Rural Fire Service	<ul style="list-style-type: none"> • Preparation of Bushfire Risk Management Plans. • Fire management.
Landcare Groups and Bush Regeneration Teams	<ul style="list-style-type: none"> • Community groups formed to tackle local land degradation and habitat rehabilitation issues.

Figure 1. Recent records of Mitchell's Rainforest Snail.

Mitchell's Rainforest Snail

Thersites mitchellae (Cox, 1864)

Status: Endangered species



These guidelines have been prepared to assist persons required to prepare or review assessments of likely impacts on Mitchell's Rainforest Snail. The guidelines will assist in the following:

- preparation of environmental impact assessment reports, Statements of Environmental Effects and Species Impact Statements by proponents of developments or activities pursuant to the *Environmental Planning and Assessment Act* 1979;
- review of environmental reports by consent and determining authorities; and
- preparation of licence applications under the *Threatened Species Conservation Act* 1995 (TSC Act).

The guidelines should be read in conjunction with the NPWS *Information Circular No. 2: Threatened Species Assessment under the EP&A Act: The '8 Part Test' of Significance* (November 1996).

Survey

Field survey and habitat assessment for Mitchell's Rainforest Snail should be undertaken by persons with suitable demonstrated experience in land snail surveys and land snail identification.

Field surveys and collection of specimens for identification purposes may result in harm to Mitchell's Rainforest Snail or damage to its habitat, and accordingly should be licensed under the TSC Act. The Mitchell's Rainforest Snail recovery plan (July 2001) includes guidelines for threatened land snail surveys (Appendix 3). These guidelines have been designed to facilitate the timely licensing of land snail survey and research licence applications under the TSC Act, whilst ensuring that licensed activities will not further threaten the survival of threatened land snail species or populations of these species.

Current knowledge indicates that Mitchell's Rainforest Snail is restricted to fragments of remaining habitat on the coastal lowlands between the Tweed and Richmond Rivers in north-east New South Wales. Mitchell's Rainforest Snail occurs in subtropical rainforest remnants and swamp sclerophyll forest with rainforest elements, typically in areas of alluvial soils with a basaltic influence. Live snails shelter in leaf litter on the ground and sometimes under bark on tree

trunks. Most of the sites where the species has been recorded are on slightly higher ground at the edge of coastal wetlands, which may reflect either patterns of land clearing or actual habitat preferences. Areas with palms and figs around the borders of coastal wetlands are particularly favoured habitat.

It is recommended that any bush remnant containing lowland subtropical rainforest in particular, but also other lowland moist forest communities, be considered as potentially harbouring Mitchell's Rainforest Snail no matter how small or degraded it might appear, especially if there is any sort of leaf litter layer present.

The shell of Mitchell's Rainforest Snail can remain in the leaf litter for extended periods following the death of the animal. Presence of the species at a site can most easily be determined by searching for empty shells or shell fragments. Accumulations of shell material can sometimes be found around feeding sites (anvils) used by the Noisy Pitta (*Pitta versicolor*).

Searches for shell material can be undertaken year round. However, surveys to locate active live animals are best undertaken at night during warm, wet weather. Live animals can also be searched for by day by identifying and investigating potential shelter sites such as fallen palm fronds, leaf litter and loose bark on tree trunks. The minimum time required to search for shell material or live animals will depend on the size and amount of potential habitat present within the site being assessed. However, it is suggested that for small sites (less than 0.5 ha) at least three hours be spent searching and then scaled up appropriately for larger areas.

It should be noted that the presence of one or more individuals would generally indicate the presence of further individuals within the site. In addition the presence of empty shells, particularly fresh shells with an intact periostracum (colouring), should be treated as indicating the presence of living individuals.

Once Mitchell's Rainforest Snail shells or live animals have been recorded on a site, or when habitat assessment suggests suitable potential habitat is present, further assessment of the distribution and extent of habitat on the site (and adjacent to the site if access is possible) should be undertaken.

Mitchell's Rainforest Snail can be easily confused with other land snail species which also occur on the coastal plain of north-east NSW, such as the common Fraser's Snail (*Sphaerospira fraseri*). Mitchell's Rainforest Snail differs from Fraser's Snail in the following characters: i) intact shell deep reddish brown to black in colour with two prominent yellow bands; ii) shell triangular in profile with a keel around the outer margin and a slightly flattened base; and iii) aperture (opening) of the shell parabolic rather than circular in outline.

Life cycle of the species

Part (a) of the eight part test asks whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction. Very little is currently known about the biology and life history of Mitchell's Rainforest Snail. It is hermaphroditic and lays clutches of up to 70 small round white eggs below the surface of leaf litter. The species is herbivorous and is thought to feed on leaf litter, fungus and lichen. It is generally active at night, particularly during or following rain. Nothing is currently known about rates of fecundity, length of life span, dispersal patterns and over what distances individuals can move.

The life cycle of Mitchell's Rainforest Snail is such that if the proposed development or activity causes the destruction of all the available habitat present within the site then the local population will most likely be lost as there is little potential to recolonise. However, if sections of the site are to be left as habitat, then the impacts of factors such as changes to microclimate, increased risk of weed invasion, fire and introduced predators will have to be addressed.

Viable local population of the species

It is currently not known what number of individuals constitutes a viable population for Mitchell's Rainforest Snail but it is not considered to be large. It is recommended that, in accordance with the precautionary principle, populations are considered viable unless proven otherwise.

Endangered populations

Part (b) of the eight part test asks whether the viability of an endangered population is likely to be significantly compromised. This question relates to populations listed under schedule 1 part 2 of the TSC Act, and does not apply to the Mitchell's Rainforest Snail.

A significant area of habitat

Part (c) of the eight part test asks whether a significant area of known habitat is to be

modified or removed. Based on the current understanding of the distribution and abundance of Mitchell's Rainforest Snail, assessment of the significance of an area of habitat should include consideration of the following:

- i) any area of habitat known to support the species;
- ii) the size and extent of an area of potential habitat;
- iii) whether an area of potential habitat has vegetation communities largely unaffected by disturbances such as fire or weed invasion;
- iv) whether the area is at the edge of the species' range; or
- v) the long term security of the area.

Where an area of potential habitat is assessed as being significant by one or more of the above criteria, either a targeted survey for Mitchell's Rainforest Snail at the site should be undertaken, or the area may be assumed to be known habitat for the purposes of the assessment.

Regional distribution of the habitat

The known distribution of Mitchell's Rainforest Snail is restricted to the coastal lowlands between the Tweed and Richmond Rivers in the NSW north coast bioregion. Populations have been recorded in the local government areas (LGAs) of Tweed, Byron and Ballina.

Isolation/fragmentation

Part (d) of the eight part test asks whether a development or activity might isolate populations such that they become no longer viable (such as through inbreeding depression). Thus the development need not directly impact on a population, but merely separate it from others by preventing movement of animals.

Mitchell's Rainforest Snail was formerly widespread but is now restricted to remnant areas of habitat in a highly fragmented urban and agricultural environment. This, and the likely limited dispersal ability, means that many of the populations of this species are already effectively isolated from others, except where they exist within the same bushland remnant or similar immediately adjacent locations. Consideration of this part of the eight part test therefore needs to be undertaken within the context that most populations of Mitchell's Rainforest Snail are already highly isolated.

As dispersal behaviour and ability are presently poorly known, it is difficult to determine what type of development may

isolate populations that are currently interacting with others.

Critical habitat

Part (e) of the eight part test asks whether critical habitat will be affected. There is presently no critical habitat listed for Mitchell's Rainforest Snail. However, the Mitchell's Rainforest Snail recovery plan includes actions for the declaration of Stotts Island as critical habitat and assessment of additional areas for identification as critical habitat. The NPWS Register of critical habitat should be consulted to obtain information on the current status of critical habitat for the species.

Adequacy of representation in conservation reserves or other similar protected areas

Part (f) of the eight part test asks whether the species or its habitat is adequately conserved in the region. The majority of the known populations of Mitchell's Rainforest Snail occur outside of current conservation reserves. The largest known population and largest remaining single area of habitat is in Stotts Island Nature Reserve in the Tweed River near Murwillumbah. Given the distribution and likely genetic diversity within Mitchell's Rainforest Snail, the current reserve system does not represent an adequate coverage of the species, particularly in the southern part of its range. The NPWS Atlas of NSW Wildlife and Museum records should be consulted for current information on records of the species in conservation reserves or other similar protected areas.

Threatening processes

Part (g) of the eight part test asks the development or activity is a threatening process. The TSC Act currently lists "high frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition"

as a key threatening process. Key habitat components for Mitchell's Rainforest Snail are a well-developed leaf litter layer (providing food, shelter and breeding sites) and an intact forest canopy (maintaining a moist microclimate and providing a source of leaf litter). Fire will impact adversely on these key habitat components.

The NSW Scientific Committee has made a preliminary determination to list "loss of biodiversity as a result of loss and/or degradation of habitat following clearing and fragmentation of native vegetation" as a key threatening process. The Mitchell's Rainforest Snail recovery plan identifies loss of habitat as the major threat to the recovery of the species.

Schedule 3 of the TSC Act should be consulted to determine whether other relevant key threatening processes are listed.

Processes that are generally considered by the scientific community as being detrimental to a species or its habitat, and which are relevant to Mitchell's Rainforest Snail, include habitat clearance and/or modification, fire, weed invasion and introduction of feral predators such as rats.

Limit of known distribution

Part (h) of the eight part test asks whether the species is at the limit of its known distribution. Mitchell's Rainforest Snail occurs only on the coastal plain of the NSW far north coast, bounded by the lower Tweed River (to the north), the lower Richmond River (to the south) and the foothills of the ranges (to the west). The most northerly recent record of the species is at Banora Point, the most southerly at Lennox Head, and the most westerly at Stotts Island near Murwillumbah. The NPWS Atlas of NSW Wildlife and Museum records should be consulted for current information on the distribution of records.

For Further Information contact

National Parks and Wildlife Service Northern Directorate Threatened Species Unit, Locked Bag 914 Coffs Harbour NSW 2450. Phone (02) 66515 946.

REFERENCES

National Parks and Wildlife Service (2001). Mitchell's Rainforest Snail *Thersites mitchellae* recovery plan. NPWS, Hurstville, NSW.

Australian Museum (2001). Threatened and Endangered Landsnail species – *Thersites mitchellae*. <http://www.austmus.gov.au/science/division/invert/mal/endangered/thersites.htm>

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Mitchell's Rainforest Snail

Mitchell's Rainforest Snail is a large native land snail found only in rainforest and swamp forest areas on the coastal plain between Ballina and Tweed Heads. Due to past land clearing in the area, Mitchell's Rainforest Snail has declined from common to extremely rare. The species is now listed as an endangered species and its lowland rainforest habitat is also listed as an endangered ecological community under the *NSW Threatened Species Conservation Act 1995*.

The National Parks and Wildlife Service has prepared a recovery plan for Mitchell's Rainforest Snail, and is seeking the assistance of the community in saving this unique species from extinction. This brochure provides information on where the snail lives and how to identify it, the threats to its survival, and how the community can assist in its conservation and recovery.

IDENTIFICATION

Mitchell's Rainforest Snail has a large shell up to 55 mm wide and 50 mm high, triangular in profile, and with a thickened lip. The shell is deep reddish brown to black in colour with two prominent yellow bands, and has a satin appearance when held in bright

light. The body colour is black with a thin lighter line along the back. Mitchell's Rainforest Snail can be confused with a number of other large native land snail species that also occur in the same area. Some of these are shown overleaf to assist correct identification.

HABITAT AND ECOLOGY

Mitchell's Rainforest Snail is found in remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Areas with palms and fig trees on slightly higher ground around the edges of wetlands are particularly favoured habitat. The snail is typically found amongst leaf litter on the forest floor, and occasionally under bark in trees. It is active at night and is thought to feed on leaf litter, fungus and lichen.

DISTRIBUTION

Mitchell's Rainforest Snail was formerly common on the coastal plain between Ballina and Tweed Heads, but is now known from only a handful of sites. The most important site is Stotts Island Nature Reserve, in the Tweed River near Murwillumbah, where over 120 hectares of rainforest habitat is protected. Other populations have been found recently at Banora Point, Byron Bay, Suffolk Park and Lennox Head. Additional populations may yet be found in rainforest remnants and wetland margins in the area.

THREATS

The greatest threat to Mitchell's Rainforest Snail is loss of habitat. Over 90% of its habitat has been cleared for agriculture and development, and many of the small areas of surviving habitat remain at risk of clearing. The value of these small remnants as habitat for invertebrates and other small native animals is often not appreciated. Additional threats to Mitchell's Rainforest Snail include degradation of habitat by fire, exotic weeds and grazing by stock, predation by rats and possibly the use of herbicides and pesticides.

HOW YOU CAN HELP

- You can assist in finding new populations of Mitchell's Rainforest Snail by forwarding details of any observations (including accurate location details) to the NPWS Northern Directorate Threatened Species Unit. Empty shells or photographs of live snails can be sent to confirm identification, but live snails should be left where they are found.



Information

Mitchell's Rainforest Snail

Thersites mitchellae

For further information about threatened
species management please contact:

The Manager
Threatened Species Unit
NSW NPWS Northern Directorate
Locked Bag 914
Coffs Harbour 2450
Telephone: 02 6651 5946

- Retain and protect any remaining areas of rainforest, and moist forest bordering wetlands, on the coastal lowlands between Ballina and Tweed Heads. Even small areas of habitat may support Mitchell's Rainforest Snail and other small native invertebrates.
- Support a Landcare Group or bush regeneration team. Weed control and bush regeneration in areas of likely snail habitat should be undertaken in a manner which protects the forest canopy and leaf litter layer and maintains a moist microclimate.
- Avoid burning the edges of rainforest remnants and wetland margins.
- Prevent ornamental plants and weeds from spreading into native rainforest and wetland areas.
- Fence rainforest remnants and wetland margins to exclude grazing by stock.
- If you live near areas of rainforest or wetland, be careful in the use of herbicides and snail baits, and consider alternatives where available.



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Threatened Species Unit
Conservation Programs and Planning
Division
Northern Directorate

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Guide to identification of land snails of the NSW far north coast coastal plain.



Mitchell's Rainforest Snail (*Thersites mitchellae*)

Reddish brown to black shell with two distinct yellow stripes, slightly flattened at base and with an angular opening.



New Holland Rainforest Snail (*Thersites novaeollandiae*)

Medium-brown coloured flattened shell with darker and lighter stripes and with an angular opening.





Fraser's Snail (*Sphaerospira fraseri*)

Cream to brown coloured shell with numerous fine stripes, rounded in profile and with a circular opening.

Giant Panda Snail (*Hedleyella falconeri*)

Large brown shell with broad darker stripes and a large opening.

Appendix 3. Guidelines for the Collection of Land Snails for Identification and Research Purposes

General Guidelines

- Any unnecessary damage to sites is to be avoided. Beyond any existing formed roads, access to sites will be by foot. No repeat collections from populations sampled within five years will be conducted, unless it is part of a specific program approved by NPWS.
- Rocks, logs and other potential refuge sites are to be returned to their original position immediately after searching.
- When collecting genetic material, a tissue sample shall be taken rather than a whole animal, unless the collection of the animal is part of a program approved by NPWS. When taking a tissue sample, it must be collected in a manner that does not compromise the survival of the specimen.
- For the purposes of live study and/or photography, one live individual from any discrete population may be held in captivity for up to five days, after which time the individual must be released at the point of capture.
- Any empty shells may be collected as voucher material, and are to be used wherever possible in preference to vouchering of live animals.
- For the purposes of collecting live specimens to be permanently retained as vouchers or for research purposes, the following prescriptions will apply:
 - Where less than 1% of the available potential habitat at a site is surveyed, a minimum of three live animals or recent shells/fragmented shells must be located before one specimen can be taken.
 - Where between 1 and 25% of the available potential habitat at a site is surveyed, a minimum of five live animals or recent shells/fragmented shells must be located before one specimen can be taken.
 - Where between 25 and 75% of the available potential habitat at a site is surveyed, a minimum of ten live animals or recent shells/fragmented shells must be located before one specimen can be taken.
 - Where more than 75% of the available potential habitat at a site is surveyed, a minimum of 15 live animals or recent shells/fragmented shells must be located before one specimen can be taken.
- Juvenile animals are to be vouchered in preference to adult animals.
- No more than two live individuals from any discrete population will be collected for voucher purposes, unless the collection of additional specimens has been specifically approved by NPWS.
- Prior to commencing any collecting on lands controlled by the NPWS, permission will be obtained from the relevant NPWS Regional Office.
- Prior to commencing any collecting on other lands permission should be obtained from the relevant owner or land manager.

Data Records

- Once identification has been confirmed, any records of threatened species will be provided to the NPWS in a format appropriate for entry into the NPWS Atlas of NSW Wildlife.
- Any person who becomes aware of first species records for NSW or of populations considered likely to extend the known range of any species is to provide such information to the NPWS within three months of becoming aware of the new information.
- Within twelve months from the date of collection of a voucher specimen or specimens, the Licensee must lodge a specimen with a recognised collection such as the Australian Museum.

Note

- If special collections, eg. additional voucher specimens, are required, the collector must consult with the NPWS Northern Directorate Threatened Species Unit prior to collection and obtain a written variation to the licence or Certificate.
- NPWS may prohibit, condition or limit collecting for some species at some sites if the collecting would affect research plots. Other conditions or prohibitions may apply after consideration of population estimates, age structure and viability. Where any doubt exists as to the advisability of permitting the collection or the level of collection to be permitted, a precautionary approach shall be enforced.



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