AUSTRALIAN PLAGUE LOCUST COMMISSION

ANNUAL ACTIVITY REPORT 2011-12

APLC
australian plague locust commission

A joint venture of the Australian Government and the Member States of New South Wales, Victoria, South Australia and Queensland.

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Introduction

The Australian Plague Locust Commission was established in 1974 and began operations in late 1976. The Commission is financed by the States of New South Wales, Victoria, South Australia and Queensland, with a matching contribution from the Australian Government. Funding allocations from the member states are in proportion to the agreed benefit delivered to that state by APLC operations, while the Australian Government contribution reflects that national benefit derived from APLC activities. The Commission is governed by six Commissioners: one from each contributing state, one from the Australian Government Department of Agriculture, Fisheries and Forestry and one from the Australian Government Department of Sustainability, Environment, Water, Population and Communities. Functional and operational management of the Commission is undertaken by a Director assisted by staff based in Canberra HQ and at three field bases in NSW and Qld. The Commission is accountable to the Ministers of Agriculture representing the five governments which finance APLC.

APLC Charter

In August 2002, a Memorandum of Understanding (MOU) was signed between the Department of Agriculture, Fisheries and Forestry (DAFF) on behalf of the Australian Government and participating member States effectively replacing the original (1974) Exchange of Letters under which the APLC was established. The MOU also incorporated a Charter that replaced the original terms of reference under which the APLC had operated since its establishment.

The purpose of the APLC, as defined in the Charter, is "to control locust populations in those situations where they have the potential to inflict significant damage to agricultural industries in more than one member state." In fulfilling its charter the APLC is required to:

- Implement a preventive control strategy to minimise economic loss to agricultural industries caused by the Australian plague locust, spur-throated locust and migratory locust, with priority given to Australian plague locust.
- Minimise risk of locust control to the natural environment, human health and markets for Australian produce.
- Develop improved locust management practices through a targeted research program.
- Provide a monitoring and forecasting system for operations conducted by APLC and member states.
- Promote and facilitate adoption of best practice in locust control by member states.
- Participate in cooperative national and international programs for development of APLC expertise.
- Continually review APLC operations to ensure they keep pace with the expectations of industry, community and government.

Commissioners (as at 31 June 2012)

Dr Colin Grant (Chair)
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Director

Mr Chris Adriaansen
Australian Plague Locust Commission
GPO Box 858 Canberra ACT 2601

Notes:
(1) Mr Kay replaced Mr Ross Burton as APLC Commissioner for NSW in March 2012.
(2) Mr Ramsey replaced Mr John Badgery as APLC Commissioner for South Australia in April 2012
(3) Mr Strong replaced Mr Andrew Wilke as APLC Commissioner for Queensland in March 2012.

Review of 2011-2012

The 2011-12 locust season was markedly different from the previous two seasons, with limited locust populations evident throughout the APLC area of operations. Only one isolated area of gregarious locust population was evident at any time during the season, that being in the north-east region of South Australia. Further details of the locust situation are provided in a later section of this report.
No areas warranted control activity by the Commission in 2011-12.

During the various after action reviews undertaken in jurisdictions affected by the 2009-11 locust upsurges, several common issues became evident in relation to locust response strategy developed and implemented. In order to deal with these effectively and efficiently, it was agreed by APLC Commissioners that these issues and others identified from stakeholder engagements would form the basis of a strategic review of the Commission.
Terms of reference for the review were endorsed by Commissioners and executives from their respective agencies in September 2011, with Dr Ron Glanville of Biosecurity Advisory Services engaged to undertake the review and develop consequent recommendations.
Extensive consultation with representatives of APLC investors, stakeholders and clients were undertaken by Dr Glanville, who presented a first draft of his report at the 69th Commissioners Meeting in May 2012. Following the discussions at that meeting, a final set of recommendations was provided to Commissioners in June 2012.
A priority for APLC in 2012-13 will therefore be to develop responses to these recommendations and an action plan for their implementation. These will be proposed to subsequent Commissioners meetings.

During 2011-12, APLC responded to the draft outcomes of a review of drift consequences from the aerial application of fenitrothion conducted by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). APLC contracted the University of Queensland Centre for Pesticide Application and Safety to assist in generating in-field data which redressed some significant anomalies resulting from the computer modelling undertaken by this review. This data demonstrated that the buffer distances currently applied by APLC are more than adequate to address drift risk under the pesticide application system employed by APLC.

2011-12 also saw continued effective collaboration with universities and others in undertaking significant research activities, including a longitudinal study on the environmental impact of locust control agents used by APLC. There was also a continuation of the valuable interaction between APLC and international counterparts, with constant recognition of the value of expertise held by the Commission and its staff.

Forecasts for the 2012-13 locust season indicate a high probability of a continuation of the very limited locust population experienced in 2011-12. This situation presents its own challenges, especially in maintaining the skills and readiness of staff during periods of low activity.

Chris Adriaansen
Director APLC

Locust situation

Australian plague locust

Overview

Following the contraction of residual high density adults in autumn 2011 to southern South Australia and Victoria, nymphal infestations were expected to occur in these regions during spring. Above average temperatures during August over much of the inland resulted in early spring hatchings in some areas. In South Australia, early instar nymphs and a number of small bands were identified in the Northeast and parts of the Murray Valley regions during September (Figure 1). In New South Wales, localised small bands developed in the south-eastern Riverina in mid-October and there were reports of isolated hatchings in the North Central region of Victoria. Further small hatchings were reported from areas around the Grampians during November.

Surveys in Queensland and other regions of New South Wales during spring indicated only low locust numbers. Population levels remained generally low throughout these states during summer. Adult numbers increased to medium density in the Northeast region of South Australia and localised swarms formed during December, following fledging of the spring generation of nymphs. Heavy rains in that region during December resulted in localised swarm egg laying in the Jamestown–Clare area of the Northeast region and a second generation developed during January. No high density adults were reported in Victoria during summer and the adult population declined to low levels.

A number of bands developed in the Jamestown–Clare area in Northeast South Australia during January and, following fledging in February, there was a further localised increase in adult densities with the formation of some swarms. Sporadic swarm egg laying occurred in this area in late March, the only known gregarious population development during 2011-12. The absence of high density populations developing in other regions may in part be attributed to dense vegetation in habitat areas, under continued above-average rainfall throughout November-March, which could have limited opportunities for locust aggregation at suitable egg laying sites.

New South Wales

Hatching commenced in the south-eastern Riverina in early October and several small bands developed in the Oaklands–Corowa area during the month (Figure 1). These nymphs fledged in mid-November but did not result in a significant regional increase in adult population. Only occasional low density nymphs were identified in surrounding areas during spring.

The population remained at very low densities in most regions during November and December. A small increase in background numbers and several areas of low density mid-instar nymphs were identified in the Menindee–Wilcannia area of the Western Livestock Health and Pest Authority (LHPA) area in mid-November. Low density local breeding produced further occasional nymphs in the Wentworth and Ivanhoe districts of Western LHPA, along with some medium adult densities, during January and March. Adult densities remained low in other regions during autumn.

Queensland

Locust population density remained at very low levels throughout inland Queensland during 2011-2012. Occasional nymphs were identified at one location in the Southwest region during September and October, but there was no detectable increase in regional adult population. Only low numbers of adults were identified in all regions during summer and autumn.

Victoria

There were reports of isolated hatchings from near Yarrawonga, Cobram and Warracknabeal in the North Central region during October and November, and further reports of nymphs over a range of stages and small bands in parts of the North Central region and the eastern Grampians district in mid-November. Bands were reported crossing roads near Colbinabbin and Corop, north of Bendigo. There were reports of nymphs on properties to the east of Ararat and some hatching in the Skipton–Gatum area in the southern Grampians. Most nymphs fledged in northern Victoria in late November, and fledging extended into December around the Grampians.

There was no reported increase in adult population densities during summer and numbers declined to low levels in autumn.

South Australia

Hatchings commenced in early September in the Hawker–Quorn–Orroroo area and east of Burra in the Northeast region where a number of small bands developed during the month. Early instar nymphs and some small bands were also identified in the Barossa Valley and the Sedan–Mannum area of the Murray Valley during September. Late instar nymphs and a number of bands were identified in the Hawker–Quorn, Hallett–Spalding and Burra-Eudunda areas of the Northeast region, and the Sedan–Mannum area of the lower Murray Valley during October and November (Figure 1). Nymphs were also reported at several locations on the western Eyre Peninsula from Ceduna south to Elliston. The first fledgling adults appeared at the end of October and the bulk of nymphs fledged during November.

A widespread medium density adult population followed in the Northeast and southern Northwest regions, and several swarms were reported near Burra in late November. Adult numbers also increased to medium density on the western Eyre Peninsula. Small areas of low density mid-instar nymphs were identified in parts of the Northeast and Northwest regions in early November, which fledged in early December and contributed to the summer adult population (Figure 2).

Sporadic swarm egg laying occurred during the second half of December in the Jamestown–Clare area and heavy rainfall in that part of the Northeast in mid-December produced suitable conditions for a high rate of nymphal survival. Second generation nymphs emerged in January and there were numerous reports of hopper bands during the first half of February (Figure 3). The highest infestation level was in the Jamestown–

Georgetown–Koolunga–Yacka–Spalding area, but bands were also reported as far south as Clare. The majority of nymphs were at mid and late instar stages in early February. Adult numbers increased following the fledging of nymphs, but few swarms were reported. Isolated autumn swarm egg laying occurred near Hallett and Orroroo.

Western Australia

In Western Australia small bands of nymphs were reported in the Mullewa–Coorow area to the east of Geraldton during October. By January a widespread population had developed in the agricultural regions of the Western Australian wheat belt from the localised spring generation. A second generation nymphal infestation, including a number of bands, was reported in the Ravensthorpe–Jerramungup area of the Southern Agricultural region in January and February. This produced a number of swarms during March and sporadic high density egg laying occurred in some areas.

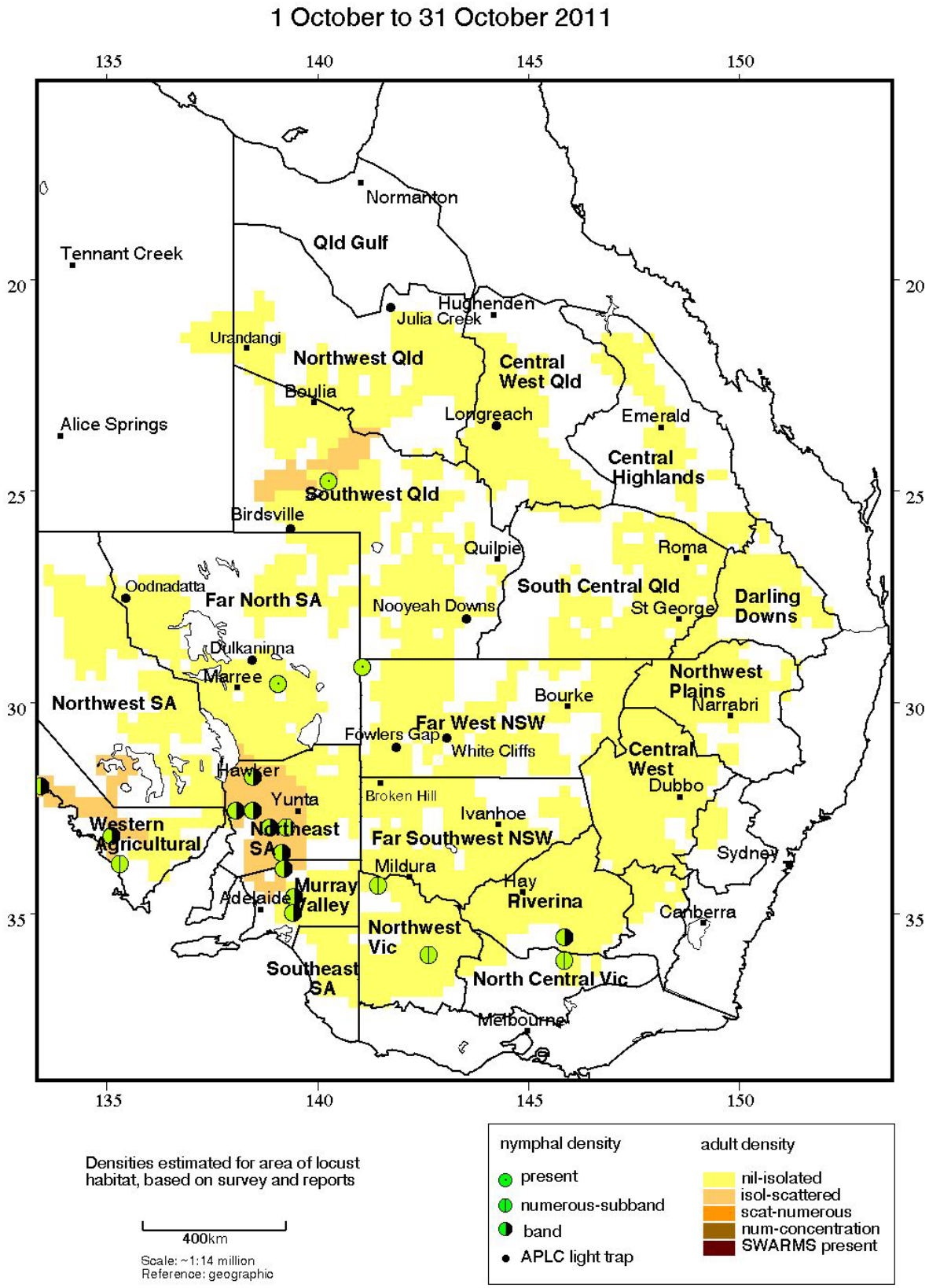

Figure 1 : Australian plague locust distribution in October 2011

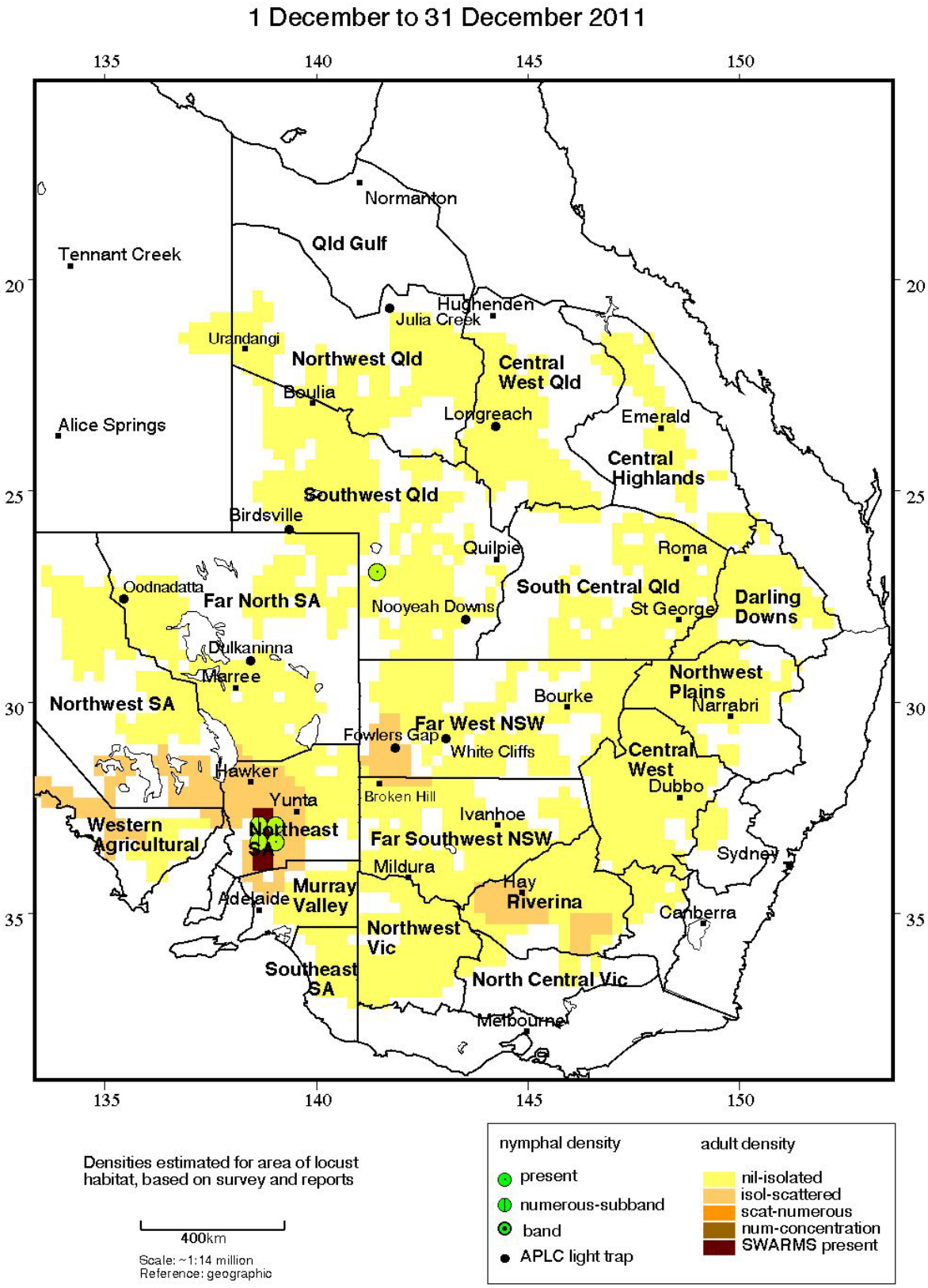

Figure 2 : Australian plague locust distribution in December 2011

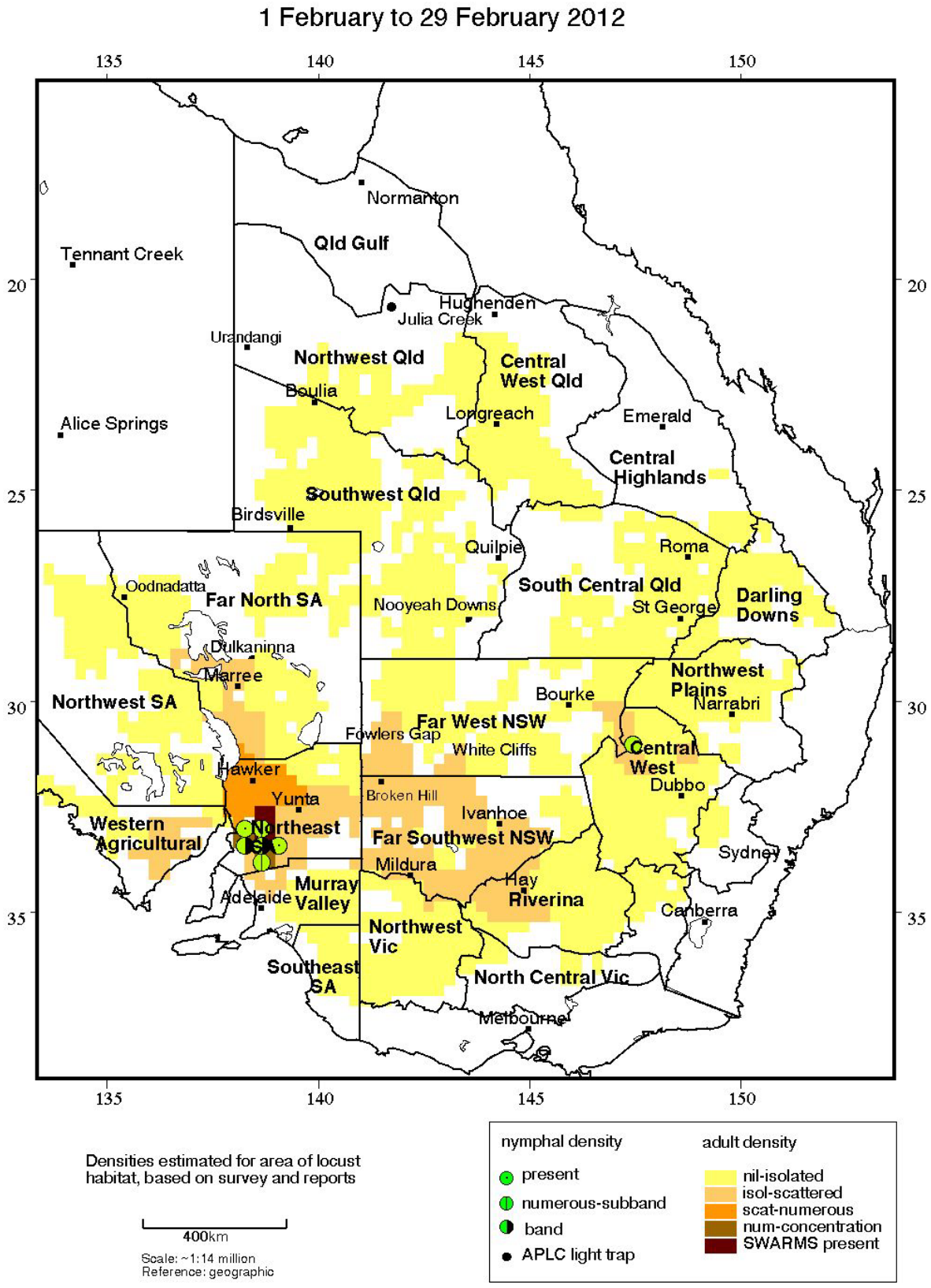

Figure 3 : Australian plague locust distribution in February 2012

Spur-throated locust

There were few reports of swarms during winter 2011, despite a widespread population of young adults the previous autumn. Reports came from Thargomindah in Queensland and Wanaaring in western New South Wales and several swarms were subsequently detected near the Paroo River, east of Wanaaring in August, but appeared to have dispersed in September. Spring surveys identified medium density adults in the Boulia area of Northwest Queensland, near Longreach in the Central West and Dirranbandi in South Central Queensland. Elsewhere in these and other regions of Queensland there were consistent low density adults. Medium density adults were identified in the Goodooga and Walgett areas of Northwest LHPA in New South Wales during November, amongst widespread low density adults throughout Northwest, Darling and Central West LHPA areas. Recorded adult numbers also reached medium densities in the southern Flinders Ranges in South Australia. There were occasional adults in other regions of New South Wales and Northern South Australia. Low density early instar nymphs were detected in the Queensland Central Highlands in November.

Recorded adult numbers remained at low densities during summer, with a decline in areas where medium densities were recorded during spring. Nymphs were recorded at a few locations and at low density throughout summer and autumn, in contrast to the previous year when medium density nymphs had been widespread. This low nymphal recruitment occurred despite frequent heavy rainfall occurring in inland regions of Queensland and northern New South Wales. During summer, low density nymphs were identified in the Longreach area of Central West Queensland and northern Barcoo Shire, although ground surveys were restricted by flooding in some areas. During autumn, nymphs were more widespread, but at low densities, in Southwest, Central West and Northwest Queensland. In New South Wales, nymphs were detected at only one location near Bourke in February. There was an overall decline in the population level of this species during 2011-2012.

Migratory locust

The population level of this species remained low throughout the 2011–2012 season and was largely confined to the Central Highlands and South Central Queensland, and the New South Wales Northwest Plains.

Surveys during spring identified occasional adults of this species in the Clermont area of the Queensland Central Highlands and the Warialda area in the New South Wales Northwest LHPA area. Occasional adults were detected in Central West Queensland and the Central Highlands during autumn. The Longreach light trap recorded low numbers in mid-February, suggesting this species was active in the region at that time than surveys indicated. No nymphs were detected during 2011-2012.

Despite the widespread and repeated rainfall events during summer providing suitable conditions for potential continuous breeding of the low density population during summer, no gregarious population development was detected.

Operations

Forecasting, information and survey

Seven Locust Bulletins were released during the period October 2011 to April 2012. Bulletins were simultaneously released via the APLC website and through direct delivery to stakeholders. Due to the low population levels which existed throughout the season, no interim Situation Updates were required.

Field survey for the presence and abundance of pest locust species continued throughout the 2011-12 season across the APLC area of operations. Staff from APLC's three field bases at Narromine, Broken Hill and Longreach persisted with regular targeted surveys despite the absence of appreciable populations. All field survey information was recorded and stored as part of the APLC Geographic Information System, where it will contribute to ongoing analysis to increase the understanding of locust population cycles, facilitating continuous improvement of the forecast modelling applied by APLC.

Both UNSW IMRs were in operation. However, not too many locust migration events were detected during the quiet season.

The OS of the Sun Ultra-45 was migrated from UFS to ZFS and RAID1 hard disk mirrors were built to avoid any file corruption from power failure.

Wind trajectory model was transplanted from Python into R, for quick numerical computation and better graphic generation.

Pesticide evaluation and application management

In response to a review of buffer zones required for the aerial application of fenitrothion undertaken by APVMA and SEWPaC, APLC generated in-field data of pesticide drift and deposition under the standard application parameters applied by the Commission.
Details of the results of this work and its implications are provided in the Research Summaries later in this report.

Control operations and pesticide use

The limited locust populations present in 2011-12 warranted no control activity. Consequently, the only pesticide application activity in 2011-12 was associated with the spray drift in-field data generation activity mentioned above.

Table 1: Pesticide application 2011-12

Control Base	*Type*	*Period*	*Number of targets*	*Area Treated (km^2)*
Broken Hill, NSW	Research	1 – 3/12/2011	4	1.55
Total area 2011 - 12			4	1.55

Table 2: Area treated (km^2) by pesticide type 2011-12

Fenitrothion	*Fipronil*	Green Guard
1.55 km^2	0 km^2	0 km^2
(100 %)	(0 %)	(0 %)

Table 3: Locust control agent stocks

	Fenitrothion [Sumithion®] (tonnes)	*Fipronil [Adonis 3®] (litres)*	*Metarhizium [Green Guard®] (≡ 14 lt ULV pails)*	*Malathion [Fyfanon®] (litres)*
On Hand @ 1 July 2011	98.5	24,400	70.43	800
Purchased 2011-2012	0	0	0	0
Used 2011-2012	0	0	0	0
Inventory @ 30 June 2012	98.5	24,400	70.43	800
Approx. equivalent area (hectares)	351,696	221,818	8,283.91	1,143
Inventory Value @ 30 June 2012	$1,663,665.25	$409,676.00	$148,352.34	$6,400.00

The total inventory value of the APLC pesticide stocks held at 30 June 2012 is approximately $2.23 million. The above figures do not include the 5 tonnes of fenitrothion held by APLC on behalf of Queensland.

Small quantities of pesticide are held at APLC field bases. The remainder (with the exception of the Green Guard stocks) is held in commercial premises in Dubbo, NSW.
Some 6,560 litres of the carrying agent for Green Guard (Summer Spray Oil) [valued at $10,824.00] held in store are not included in the above figures.

Stocks of Green Guard include both formulated product and dry spore material. The quantities of Green Guard stock listed above are expressed in 14 litre container equivalents. Green Guard stocks are held by the supplier, Becker Underwood. The shelf-life of Green Guard stored by the manufacturer [@ 4^{o}C] is guaranteed for 2 years but is only guaranteed for approximately 6 months in the field [@ 25^{o}C]. Stored inventory is turned over and replaced when practicable.

Environmental Management System

There were no gregarious populations of locusts in the eastern half of Australia and no campaign related environmental assessment or work was undertaken.

A brief report of the progress made by the APLC in meeting the objectives of its Environmental Management System (EMS) is provided at Annex 2.

As a continuation of the APLC's Environmental Research Program, a successful funding application was made to the Australian Research Council's Linkage Program to quantify the comparative effects of a chemical (Fipronil) and a biological (*Metarhizium anisopliae* var. *acridum*) pesticide used by the APLC for locust control. This collaborative research project brings together expertise from the University of Wollongong, Macquarie University, Flinders University and the APLC to document the impacts of the APLC's locust control operations in an arid grassland ecosystem by monitoring termite activity, invertebrate population responses, soil nutrient turnover, litter decomposition rates and predator-prey interactions (using species of herpetofauna as a model predator). This project will investigate the effects of reducing the amplitude of a pulse of high food availability, through the use of pesticides to control locust outbreaks by quantifying the impact of the abovementioned pesticides on the structure and function of semi-arid grasslands. Core to our approach is a large field-based experiment with replicated spraying treatments monitored over a three year period.

Previous APLC research documenting the application of polyethylene (PE) as an equilibrium passive sampler using two types of PE was published in an internal report (see below). Low (LDPE) and high (HDPE) density PE were investigated for their suitability for use with passive sampling devices (PSDs) and polyethylene/water partition coefficients (CPE/CW or KPEW) were determined for both materials. Although LDPE returned suitable partition coefficients for fenitrothion, the relatively small partition coefficient obtained for fipronil made LDPE unsuitable for field use. HDPE provided good partition coefficients for both fenitrothion and fipronil and so was used in the field component of this project. Fenitrothion was detected using HDPE filled PSDs however HDPE samplers failed to detect fipronil in water bodies downwind of spray applications.

Occupational Health & Safety

The APLC and APLC Commissioners received YTBN's helicopter safety review recommendations in October 2011 and accepted the majority of recommendations with minor comments in November 2011.
The APLC has progressed implementation of the recommendations through updates to the Operations Manual, Training Documents, Aerial Procedures Manual and Draft Tender documents as reported in Annex 3.

Competency based training and assessment

Five new field staff were employed at the start of the 2011 season, Kellie Arnall, Lauren Beattie, Ryan Knapp, Kate Lightfoot and Noel Green. Heather Brooks resigned at the end of 2011.
Although no control or aerial surveillance work was carried out in 2011-12, all five new Field Assistants progressed well through their first season of competency based training in all other areas of field operations.

International linkages

APLC Director, Chris Adriaansen was invited by the United States Department of Agriculture National Grasshopper Management Board (NGMB) to chair a discussion and review panel on the use of biopesticides and biocontrol for locust and rangeland grasshopper control in the USA. Outcomes from the NGMB panel have contributed to redefining the direction of research and development activities in this area.

Mr Adriaansen was also invited by the UN-FAO locust management group to attend the 40th international Desert Locust Control Committee (DLCC) meeting in Rome in June 2012. While APLC is obviously not directly affected by desert locust or the associated management operations in Africa and the Middle East, continued engagement in this forum is worthwhile. At this meeting, considerable input was provided to the development of the response plans for several emergent threats in Africa and the Middle East. Discussions between APLC, FAO and several participating jurisdictions also established the basis for the placement of two "trainees" from Central Asian countries in February 2013, to work with APLC for several weeks to gain experience in the aerial application of biopesticides for locust control.

Haikou Wang was invited by Prof Baoping Zhai from the Nanjing Agricultural University to deliver a keynote speech about the return migration of Australian plague locust in eastern Australia on the workshop of Insect Migration: the Behavioural Art in Ecological Arena, Nanjing, China, 16-19 July 2011. More than 30 leading scientists, emeritus professors and central government advisers from Chinese universities, academic institutes and government agencies attended the workshop. After the workshop, Haikou visited the Department of Entomology at the university and Prof Zhai's colleague Associate Professor Zhongrong Chen, who developed the X-band Doppler vertical pointing entomological radar, at the Nanjing University of Information Science & Technology.

An 11 member delegation led by Mr Zhonghua Zhao from the National Agro-Tech Extension and Service Centre, Ministry of Agriculture, China, visited APLC on 23 Nov 2011. During their visit, APLC staff presented talks covering research and operation activities and exchanged locust management experience with the delegation.

A 5-student delegation led by Associate Professor Kyeong-Yeoll Lee from the Kyungpook National University, Korea, visited APLC during 30-31 Jan 2012. The visit was supported by the university's Global Challenger Program, which aims to introduce the senior undergraduates to the world's top entomological research and pest management groups. Their Australian visit (to University of Sydney, Australian National University and APLC) was coordinated by Haikou Wang and James Woodman. During their visit, APLC staff delivered talks on APLC's research and operation activities.

Dr Hongqiang Feng, who was a CSIRO visiting scholar from the Institute of Plant Protection, Henan Academy of Agricultural Sciences, China, visited APLC on 08 May 2012, accompanied by Dr VA Drake from the University of New South Wales at the Australian Defence Force Academy. Dr Feng has been working on the migration of cotton bollworm and has been interested in radar technology and modelling skills. He later visited the two UNSW insect monitoring radars at Bourke, NSW, and Thargomindah, Qld, and two APLC soil moisture stations at Nooyeah Downs and Tambo, Qld, 15-21 June 2012, accompanied by Haikou Wang. These remote-sensing stations are managed and maintained by APLC.

Administration

Governance

APLC Commissioners Meetings were held on 1st December 2011 (68th APLC Commissioners Meeting) and 23rd May 2012 (69th APLC Commissioners Meeting). Commissioners were also provided with quarterly financial performance reports during 2011-12.

Full records of Commissioners Meetings and all decisions taken at those are archived with APLC and held by all member jurisdictions.

Key governance decisions taken by APLC Commissioners in 2011-12 were:

- APLC Strategic Review – The terms of reference, external reviewer and configuration of the final recommendations of this review were endorsed. A copy of the final Review recommendations was provided to Commissioners and member agencies in June 2012, and these are provided at Annex 5 of this report.
- APLC Risk Policy – A policy and procedure for the management and acceptance of risk within APLC was endorsed by Commissioners. This policy and procedure is aimed at addressing the issues associated with the joint venture legal status of the Commission, as well as ensuring that Commissioners discharge their obligations under new Work Health and Safety legislation as "officers" who must participate in the risk decision process for APLC activities.
- Low-level helicopter use – While not fully resolved, decisions of the Commissioners have progressed key facets of this issue, including agreement to develop and apply a common audit standard for supplying contractors of helicopter services and the mutual recognition of audit outcomes.
- APLC branding – Commissioners determined that the use of a logo or identifier belonging to only one of the member agencies or investing governments was not appropriate, and that the profile and integrity of APLC as a widely recognised and accepted entity must be maintained through appropriate branding which also ensured that all investors in the Commission were fully recognised.

Staffing

While staffing within APLC HQ and among the Officers-in-Charge of APLC field bases has been stable throughout 2011-12, there has been a substantial turnover of field assistants during the year. There has also been some change in the part-time ancillary staff employed to manage APLC light traps in several locations.

Mr. Noel Green commenced employment with APLC on the 19th September 2011 to fill a vacant Broken Hill field assistant position.

Miss Kate Lightfoot commenced employment with APLC on the 18th September 2011 to fill a vacant Broken Hill field assistant position, but subsequently resigned on 10th April 2012.

Miss Lauren Beattie commenced employment with APLC on the 17th October 2011 to fill a vacant Narromine field assistant position. Miss Beattie subsequently resigned on the 25th May 2012.

Miss Kellie Arnall commenced employment with APLC on the 19th September 2011 to fill a vacant Narromine field assistant position.

Mr Ryan Knapp commenced employment with APLC on the 19th September 2011 to fill a vacant Longreach field assistant position.

Miss Heather Brooks resigned her position as field assistant based at Narromine on the 17th February 2012.

Mr Ashley Johnson, field assistant Narromine, resigned 8th July 2011.

Ms Gaye Nicholls, Light Trap Operator at Julia Creek, resigned in September 2011.

Ms Rebecca Smith commenced as Light Trap Operator at Julia Creek in September 2011 and resigned on the 21st December 2011.

Table 4: 2011-12 APLC Staffing position

Officer	Position	Location	Period Employed
C. Adriaansen	Director	Canberra HQ	Throughout
W.Spratt	Deputy Director	Canberra HQ	Throughout
E.Deveson	Forecasting & Information Officer	Canberra HQ	Throughout
P.Spurgin	Application & Control Officer	Canberra HQ	Throughout
P.Story	Environmental Officer	Canberra HQ	Throughout
J.Woodman	Entomologist	Canberra HQ	Throughout
H.McCrae	OH&S & Training Officer	Canberra HQ	Throughout
H.Wang	GIS and Information Officer	Canberra HQ	Throughout
L.Veness	Business Support Officer	Canberra HQ	Throughout

Officer	Position	Location	Period Employed
R.Graham	Officer-in-Charge	Broken Hill	Throughout
N.Green	Field Assistant	Broken Hill	From 19/09/11
K.Lightfoot	Field Assistant	Broken Hill	18/09/11 to 10/04/12
J.Nolan	Officer-in-Charge	Narromine	Throughout
L.Beattie	Field Assistant	Narromine	17/10/11 to 25/05/12
H. Brooks	Field Assistant	Narromine	To 17/02/12
A. Johnson	Field Assistant	Narromine	To 08/07/11
C.Mulcahy	Officer-in-Charge	Longreach	Throughout
K.Arnall	Field Assistant	Longreach	From 10/09/11
R.Knapp	Field Assistant	Longreach	From 10/09/11

Note: The above staffing table does not include the seven part-time (casual) staff employed to operate the APLC light trap network across inland eastern Australia.

Finance

Total revenue in 2011-12 amounted to $4.804 million. Expenses recorded in the 2011/12 period report amounted to $3.717 million resulting in a net operating surplus of $1.087 million. The surplus was carried over to the 2012-13 financial year as part of the accumulated reserve, as shown in the 20011-12 financial performance report (Annex 1). This accumulation of surplus into the reserve fund is in accordance with the Memorandum of Understanding, a condition that was reconfirmed by decision of the 62nd Commissioners Meeting in April 2008.

The surplus of income over expenditure for 2011-12 was delivered principally as a consequence of no control operations or expenditure occurring during the year. Staff vacancies at various times during the year also contributed to this result.

In accordance with APLC budgeting policy endorsed by Commissioners in May 2012, the value of the Reserve Fund will be held at (or close to) $3 million, with any accumulated reserve in excess of that amount to be applied to a reduction in funding contributions requested of investing jurisdictions for the following financial year. As a consequence, contributions requested for the 2012-13 APLC budget are likely to reflect the application of some $700,000 of reserve funds.

Key Performance Indicators

The 2005 external review of the APLC suggested a number of Key Performance Indicators (KPIs) against which the future performance of the APLC could be measured. These KPIs have been adopted with some modifications to provide additional semi quantitative measures for reporting on an annual basis. Details of the KPIs and performance measures together with an assessment of the APLC's performance in 2011-12 against these are summarised in Table 5.

Table 5: APLC 2011-12 Performance against KPI measures

Key Performance Indicator	KPI Measures	Assessment/comments (2011-12)
Effectiveness of monitoring, prediction and control of locust populations	- Significant populations detected at early-mid instar stage	- No significant populations were detected in 2011-12, despite extensive scheduled surveillance.
	- Accuracy of forecasts of population scale, timing and location	Forecast information was appropriately limited, reflecting population levels.
	- Majority of control measures against nymphal stage	No control activity undertaken during 2011-12
	- No adverse aerial spraying incidents	Not applicable, as no control activity.
Availability and effectiveness of control agents	- Availability of existing agents	No change to availability of current control agents. Issues raised in APVMA fenitrothion review were identified and field data generated to address potential impacts upon APLC patterns of use
	- Replacement agents identified and application rates/techniques verified	Discussions held with Aust agent for major IGR product, with evaluation trial designed. Trial permit will be secured once locust population levels increase to levels where trials can be conducted.
Environmental impact of control	- No reported/observed significant adverse impacts	Not applicable, as no control activity.
Trade risks minimised	- No adverse trade (residue) impacts	Not applicable, as no control activity.
Cooperation with environmental, OH&S and other relevant agencies in developing and implementing plans for control programs	- Plans developed and agreed and reviewed on regular basis.	No change required to current agreements and arrangements.

Key Performance Indicator	KPI Measures	Assessment/comments (2011-12)
Ensuring OH&S of APLC staff, including aerial safety	- No significant OH&S incidents	No safety incidents reported in 2011-12.
Improved management practices developed through a targeted research program	- Research findings incorporated into APLC control strategy and operations	Research activities (detailed in Research section of this report) linked to key strategic issues of APLC operations, including environmental impact and pesticide application technology. Major longitudinal study of environmental impact commenced, which will identify where current practices should be modified to further reduce off-target impact.
APLC staff participation in national and international programs/scientific conferences	- APLC staff invited to participate in appropriate programs and conferences	National and international scientific and technical conferences and meetings were attended and addressed.
Training of member state staff	- APLC training course developed and core of trained member state staff available	No training requested for Member State agency staff.

Research

Purpose and research areas

In carrying out its charter, the APLC identifies and undertakes research to plan for, and be responsive to, issues relating to its activities. These include, but are not limited to, the efficient monitoring and accurate forecasting of locust populations, the potential environmental and trade impacts of its control programs, the cost and efficacy of control agents, and the decision-making of locust control. An ongoing research program is essential to addressing these issues now and into the future. The three research areas are:

- Improvement in efficacy and reduction of risks associated with **control agents and application technology** addressing both immediate and future issues.
- Identification and measurement of **environmental** and trade (residue) risks potentially resulting from the APLC's operations and integration of research results into the agencies' core business.
- Improved understanding of the **population ecology** of locusts to improve the performance and effectiveness of existing surveillance and forecasting systems as well as improving planning, preparedness and early intervention strategies.

Research Collaborations

The value of the collaborative research strategy adopted by APLC is demonstrated in Table 6. In addition to the significant intellectual power which is being harnessed from (in particular) the university sector to undertake locust research, APLC investment through Australian Research Council (ARC) linkage projects is securing a total value of research in the order of $1.6 million for the direct investment by APLC of less than $0.5 million over the four year project life of the current ARC funded project listed below. This represents a research investment leverage of greater than 3:1.

Table 6: 2011-12 APLC contribution to collaborative research projects

Project title	Collaborators	2011-12 APLC Contribution			2011-12 Total project value (all investors)
		Cash	In-kind	Total	
Ecosystem-wide impacts of various locust control methods	University of Wollongong; Macquarie University; Flinders University	$105,186	$55,254	$160,440	$357,748

Summaries of research in progress

The following research summaries provide an overview of current research activities being undertaken by the Australian Plague Locust Commission. The research summaries are not considered to constitute publication as the investigations are often incomplete and any results presented tentative.

1. Control agents and application technology

1.1: Spray drift field study – aerial application of Sumithion ULV on rangeland

A field study was conducted in rangeland near Broken Hill, NSW, to determine the extent of spray drift from applications of fenitrothion (Sumithion ULV) at operational rates (approximately 220 mL/ha or 280 g a.i./ha) on a typical locust control target using a spray aircraft fitted with 2 Micronair AU5000 rotary atomisers. This study was a joint collaboration between the APLC and the University of Queensland Centre for Pesticide Application and Safety (CPAS). Both on- and off-target deposition were measured under a range of meteorological conditions normally encountered during control operations (wind speeds of 8-15 km/h) including reasonable worst-case conditions of high wind speed (up to 23 km/h). Spray deposition was measured both within the swath and beyond the swath (50 m upwind and at various distances downwind of the application run out to 3 km total sampling distance) using a range of collection media common to spray drift studies (ISO standard 22866 followed).

The field data showed the expected decrease in spray deposition against distance from the aircraft flight line (spray run). Deposition rates fell below 1% of the application rate beyond 500 m of the spray line and were consistently below 0.1% of the application rate at distances beyond 1,000 m downwind of the spray line. There was no upwind drift.

The spray sampling system using fluorescent tracer dye (Uvitex OB) and filter paper agreed well with the other technique of using active ingredient from alpha cellulose cards. The dye/filter paper sampling system was effective to distances of 200 m (filter papers) to 1,000 m (pipe cleaners), beyond which deposition rate were below the level of detection for this system.

The AGDISP spray drift prediction model over-predicted drift for similar variables to each field study scenario, but did provide similar rankings of deposition rates across the four spray runs of the trial. Model use compared to field study data use would suggest a considerable increase in the size of no-spray buffer zones. However, when the Gaussian Extension tool in the model was implemented, the spray drift predictions were very close to the measured field data.
This work is being prepared for publication in the peer-reviewed literature.

2. Environmental impact

2.1 Australian Research Council Linkage project ((LP110200105): Is locust control a low cost to the environment? Ecosystem-wide impacts of different locust control methods.

Animals in semi-arid ecosystems respond positively to natural pulses of food availability. New perturbations that interrupt these pulses are likely to have significant ecosystem effects. This research, funded by the Australian Research Council's Linkage Program (2011) will investigate the effects of reducing the amplitude of a pulse of high food availability, through the use of pesticides to control locust outbreaks. Using the University of New South Wales, Fowler's Gap Research Station in western New South Wales, we will quantify the impact of two pesticides, used by the APLC, fipronil (a phenyl pyrazole) and *Metarhizium anisopliae* var. *acridum* (a bio-pesticide), on the structure and function of semi-arid grasslands. Core to our approach is a large field-based experiment with replicated spraying treatments. We will assess impacts on non-target invertebrates, their predators, reptiles, and soil processes including decomposition, nutrients and changes in microbial assemblages through time. Further, this research will quantify and compare the extent and duration of ecological impacts of fipronil and *M. anisopliae* var. *acridum* applications on the structure and function of semi-arid grassland ecosystems. The project will also provide fundamental ecological insights into the impacts of reduced amplitudes of the irregular resource pulses these ecosystems rely on.

Pre treatment samples and method developed commenced in January 2012. We anticipate applying the pesticide treatments in March 2013. Most field studies of the ecological impacts of insecticide application have been in heavily modified agricultural landscapes. The pastoral land use, where locust spraying will be used, represents a more natural ecosystem. This represents an exciting globally relevant approach that will allow better informed decisions on locust control both in Australia and elsewhere.

2.2 Comparative risk assessments of pesticide used for locust control throughout the world.

Several methods exist for building species sensitivity distributions (SSDs) that allow the estimation of the probability of lethality as a result of pesticide exposure. The APLC's Environmental Officer, Mr Paul Story, is currently working with Dr Pierre Mineau (Research Scientist and Program Leader, Pesticides Section, Environment Canada and Adjunct Professor at Carleton University) on the development of comparative risk assessments for pesticides used throughout the world for locust control. Pesticides registered in Australia, USA, Canada, European Union as well as those on the World Food and Agriculture Groups (FAO) approved list will be evaluated.

An appeal for new and updated research data, specifically as it relates to pesticide residue values on either insects or vegetation, has been extended to the world-wide scientific community through various key researchers and research agencies. It is envisaged that the incorporation of this data with new, more probabilistic risk assessment methods, will enable risk assessments for insecticides currently used for locust control to be updated and compared. Risk assessments derived within this research project will potentially be more protective because we will first look for the influence of body-weight scaling on toxicity and use that as covariate before developing pesticide specific species sensitivity

distributions. Benefits to locust control agencies, such as the APLC, will flow from these improved comparative risk assessments, enabling improvements in their environmental performance through the selection of "environmentally softer" pesticides for spray operations.

3. Population Ecology and Dynamics

3.1: Overwintering physiology of pre-reproductive adult Spur-throated locusts

This study aims to describe and quantify the physiological basis to overwintering adult survival in *A. guttulosa* as part of a broader objective to improve our understanding of Australian locust population ecology. Results to date show impressive cold tolerance for a predominantly sub-tropical insect. The body fluids freeze between -6 and -12.8°C depending on body size and the amount of freshly eaten food. Dissections of the digestive tract have also shown an impressive reaction to the absence of food. The usual direction of food movement through the gut is reversed so that processed food destined to pass out of the locust within 24h is moved back up to the front. It can be held there for several days to maximise water and nutrient extraction and delay the effects of starvation. This work is now published in the peer-reviewed literature.

3.2: Parasitism rates, life history and reproductive biology of *Scelio fulgidus*

Scelio fulgidus is a widely distributed egg endoparasitoid of the Australian plague locust that can exert considerable influence on locust population dynamics. The only previous experimental data for *S. fulgidus* longevity was from 1935 and suggested total mortality within 15 days. This study reports *S. fulgidus* longevity from different seasonal histories at 5 diurnal temperature regimes in the laboratory. Longevity was sensitive to temperature and means ranged from 5 - 28 d in males and 10 - 33 d in females at 35/20°C and at 15/0°C (day/night) respectively. Maximum female longevity in the cooler 20/5°C and 15/0°C treatments was 78 and 74 d respectively. There was no significant difference in the longevity of *S. fulgidus* drawn from different seasonal populations, or those from diapause eggs exposed to 15^{o}C in soil for 100 d before hatching. These data considerably increase individual maximum longevity for the species. This work is being prepared for publication in the peer-reviewed literature. Further work on other aspects of the life history and reproductive biology of the species are being planned and will commence relative to opportunity for field sampling.

3.3: Effects of inundation on Australian plague locust egg development and viability

This study is quantifying the effects of different inundation durations at different temperatures on locust egg development and viability. Development rates, egg survival, hatchling condition and nymph survival to 2nd instar are being quantified to estimate the impacts of flooding on population dynamics in the field. Preliminary results are showing that most eggs can survive > 14 d, unless soil temperature is ≥ 25°C. Additionally, the embryonic development stage at the time of flooding is important whereby eggs inundated at later stages face higher mortality. This work is being prepared for publication in the peer-reviewed literature.

3.4: Diapause initiation relative to cumulative photoperiod change in the Australian plague locust

Experiments are underway to determine the effects of varying amounts of cumulative photoperiod change throughout the lifecycle of *C. terminifera* on diapause initiation. Results of this work will have direct implications for APLC forecasting and population monitoring.

3.5: Physiological regulation of feeding and responses to starvation in Orthoptera

To date laboratory work has investigated the metabolic and hygric consequences of feeding and starvation using the black field cricket as a model species. Subsequent work will use locusts to investigate the biochemical and physiological regulation of feeding and starvation with applied relevance in understanding how different species and different life stages respond to food availability and tolerate poor conditions. There is also the potential for discovering specific biochemical targets for disrupting the capacity to process ingested food material. This work will form the basis for developing a larger collaborative ARC linkage application with Dr Paul Cooper at the Australian National University.

3.6: A review of the population ecology of the Australian plague locust

This project is acquiring and synthesising all relevant information on the key factors that influence locust population size. The resultant publication will improve APLC's knowledge base and identify important knowledge gaps and priorities for future research.

3.7: Locust immunity and native disease organisms as possible new control agent candidates

Stemming from the mass epizootic near Hillston in November 2010, this project aims to (i) identify and quantify the microbiota occurring in *C. terminifera* populations across seasons and regions, (ii) compare immune function and disease resistance in locust populations from different regions, (iii) quantify the effects of locust nutritional state on immune function and disease resistance, (iv) study the pathogenicity of *Pseudomonas* sp. collected in 2010 as well as any other identified candidate disease organisms, and (v) explore the effects of pathogens on locust ecology and behaviour. Preliminary work is underway and an ARC linkage application with Professor Stephen Simpson and Dr Rob Graham at the University of Sydney is in development.

3.8: Collective movement in the Australian plague locust

With the successful testing of the UAV fitted with an optical locust tracker to monitor the movement of *C. terminifera nymphs* within bands, planning for an operational trial of the unit began. Egg beds in the Burra-Mt. Barry area of South Australia are likely to produce a suitable population of nymphs with bands expected in October.

Publications

Buhl J, Sword GA and Simpson SJ (2012) Using field data to test locust migratory band collective movement models. *Interface Focus* 2, 757-763.

Deveson ED (2011) The search for a solution to Australian locust outbreaks: how developments in ecology and government responses influenced scientific research. *Historical Records of Australian Science* 22, 1-31.

Deveson ED (2012). *Naturae Amator* and the grasshopper infestations of South Australia's early years. *Transactions of the Royal Society of South Australia* 136 (1) 1-15.

Hansen MJ, Buhl J, Bazazi S, Simpson SJ and Sword GA (2011) Canabalism in the lifeboat – collective movement in Australian plague locusts. *Behavioural Ecology and Sociobiology* 65, 1715-1720.

Story PG, Hooper MJ, Astheimer LB and Buttemer WA (2011) The acute oral toxicity of the organophosphorus pesticide, fenitrothion, to fat-tailed and stripe-faced dunnarts and it's relevance for pesticide risk assessments in Australia. *Environmental Toxicology and Chemistry* 30(5):1163-1169.

Story PG, Mineua P and Mullie WC (2012) Insecticide residues in Australian plague locusts (*Chortoicetes terminifera* Walker) after ultra-low volume aerial application of the organophosphorus insecticide, fenitrothion. *Environmental Toxicology and Chemistry (in press)*

Story PG, Vanek M, Mueller J and Hawker D (2012) Application of equilibrium passive samplers to monitor pesticides in water bodies during a locust control event – Quilpie, Queensland 2002. Australian Plague Locust Commission Research Report 1-2012, 21 pp.

Woodman JD (2012) Cold tolerance in the Australian Spur-throated locust, *Austracris guttulosa*. *Journal of Insect Physiology* 58, 384-390.

Conference proceedings

Hose G, French K, Maute K, Story PG and Bull M (2012) The comparative effects of a biological (*Metarhizium acridum*) and a chemical (Fipronil) pesticide on arid-zone grassland ecosystems Poster number 128. Presentation at *Society of Environmental Toxicology and Chemistry (Australia) Conference*, Brisbane, July 2012.

Annex 1 : 2011-12 APLC Budget and Financial Performance

Australian Plague Locust Commission
Financial Performance Report
Year-to-date to End June 2012

	2011-12 APLC Endorsed Budget	Actual Expenditure to end June 2012	Expenditure Variance to end June 2012
Expenses			
Employee Wages and Salary	1,421,000	1,204,000	217,000
Superannuation	274,000	221,000	53,000
Leave, Other Entitlements and Benefits	177,000	338,000	-161,000
Staff Development and Recruitment	38,000	29,000	9,000
Total Employee Expenses	**1,910,000**	**1,792,000**	**118,000**
Insecticide Expensed	213,000	0	213,000
Bio-Insecticide Expensed	312,000	0	312,000
Helicopter Charter	54,000	0	54,000
Fixed Wing Aircraft Charter	169,000	29,000	140,000
Aerial Spray Aircraft Charter	150,000	0	150,000
Aviation Fuel	20,000	0	20,000
Control Ops: Equipment & Freight	60,000	0	60,000
Control Ops: Travel	70,825	0	70,825
Sub-Total: Control Operations	**1,048,825**	**29,000**	**1,019,825**
Light Trap Operations	10,000	11,000	-1,000
Other Technical & Field Expenses	56,000	32,000	24,000
Vehicles - Leasing and Repairs	320,000	200,000	120,000
Travel	155,000	185,000	-30,000
IT and Communications	190,000	125,000	65,000
Contractors, Research and Analytical Testing	170,000	156,000	14,000
Other Administrative	7,900	7,000	900
Offical Hospitality	-	-	0
Office Equipment , Stores and Consumables	15,000	8,000	7,000
Subscriptions and Publications	20,000	2,000	18,000
Production Of Publications	7,000	2,000	5,000
Property, Rent and Off Site Storage	-	73,000	-73,000
Memberships & Conferences	9,000	1,000	8,000
Consultancy Services	35,000	33,000	2,000
Comms Media and Advertising	2,000	6,000	-4,000
Legal	7,000	2,000	5,000
Total Supplier Expenses	**1,003,900**	**843,000**	**160,900**
Sub-Total: Salaries + Control Ops + Supplier Expenses	3,962,725	2,664,000	1,298,725
Depreciation & Amortisation	59,892	114,000	-54,108
Corporate Expenses - Government Process	147,374	261,000	-113,626
Corporate Expenses - Business Overheads	634,884	678,000	-43,116
Interest Expense	-	-	0
Total Write-down of assets	-	-	0
Total Other Expenses	**842,150**	**1,053,000**	**-210,850**
TOTAL	4,804,875	3,717,000	1,087,875

Revenue	
Commonwealth	1,981,113
Member States	1,981,113
Commonwealth: Additional Funding For Overheads	494,762
Member States Additional Charge - Overheads	347,387
Misc Revenue	
Total Revenue	**4,804,375**

Reserves At Start Of 2011-12 Financial Year	**2,408,626**

Cost Sharing of Endorsed 2011-12 Budget

Member Jurisdiction	% share	Core Contribution	Govt Process Overheads	Business Overheads Contribution	TOTAL CONTRIBUTION
Commonwealth	50.0%	1,981,113	147,374	347,388	**2,475,875**
New South Wales	32.5%	1,287,723		225,802	**1,513,525**
Victoria	10.0%	396,223		69,477	**465,700**
South Australia	5.0%	198,111		34,739	**232,850**
Queensland	2.5%	99,056		17,369	**116,425**

Annex 2: Environmental Management System conformance 2011-12

Program	Sub-project	Progress (2011-12)
1. Excellence in all operational areas	Staff trained to full field competence	*Four APLC field resigned at the start of the season and five new field assistants were employed. Although no control operations occurred during the season all new staff progressed through their first season of competency training in all other areas of field operations.*
	DGPS used in all aircraft	*N/A*
	Improved control efficiency	*N/A*
2. All waste managed appropriately	Waste management contract	*No waste requiring disposal*
3. Minimise the intensity, extent and duration of disturbance to native flora and fauna	Incidents effectively managed	*N/A*
	Reduce the proportional use of fenitrothion in control ops	*N/A*
	Increased successful use of fipronil and larger track spacing	*N/A*
4. Contribute to our understanding of natural and managed ecosystems	Develop risk assessment process for APLC pesticides, based on outcomes of environmental research.	*APLC successful in receiving an Australian Research Council linkage grant to undertake collaborative research with Wollongong, Macquarie and Flinders Universities to investigate the effects of Adonis 3UL and Green Guard on invertebrate abundance, predator-prey relationships and the function of ecological processes in arid zone grassland agro-ecosystems over a 3-4 year period.*
	Develop field protocols based on research	*Relevant research results still pending.*
5. Avoid disturbance to protected sites/areas	Development of the GIS, OpsManager® and PDA handhelds sensitive area maps and database	*Review of upgrade options to OpsManager and PDA handhelds begun.*
	Procedures and buffers developed to avoid disturbance	*No change*
6. Ensure stakeholders are aware of all environmental obligations and they assist APLC achieve these.	Develop environmental aspect into APLC stakeholder training course.	*No external stakeholder training requested or undertaken*
	Landholder consultation prior to and after pesticide application	*N/A*

Annex 3: Occupational Health and Safety Management System (OHSMS) Review 2011-12 – Progress on Recommendations

	Recommendations	Status/Progress
OHSMS		
1	Put in place ongoing review (annual basis) of OHSMS	Accepted. Established as part of annual planning & review cycle
2	Review structure and appropriateness of DAFF OHS policy to operations of APLC	Awaiting clarification prior to identifying action
3	Consider framework for replacement OHS Agreement if required.	Awaiting clarification prior to identifying action
4	Set Objectives and Targets for OHSMS performance	Accepted. OHSMS will be revised to incorporate
5	Review clear statement of responsibilities and accountabilities	Accepted. OHSMS will be revised to incorporate
6	Strengthen formal reporting arrangements in relation to OHSMS	Awaiting clarification prior to identifying action
7	Update OHS Policy Manual to same status as Operations Manual	Completed
8	Review currency of documentation	Completed
9	Establish consistent Risk Scoring template and more robust Risk Assessment p	Awaiting clarification prior to identifying action
10	Implement more rigorous Electrical Testing and Tagging framework	Completed
11	Formalise risk evaluation process	Awaiting clarification prior to identifying action
12	Review Emergency Preparedness particularly in relation to vehicle based remo procedures	Awaiting clarification prior to identifying action
13	Improve the comprehensiveness of the reporting arrangements in relation to th OHSMS	Accepted. OHSMS will be revised to incorporate
14	Develop a more comprehensive approach to internal audit and inspection proce both systems and facility level	Accepted. Established as part of annual planning & review cycle
15	Develop a more formalised Management Review process	Accepted. Established as part of annual planning & review cycle
Physical Operations		
16	That the safe work limit (SWL) markings on the tail gate lifter fitted to the truck be converted to metric and expressed in equivalent maximum number 100 L drums to be loaded at any time.	Completed
17	Signage adjacent to field base entries to be refreshed so that it is clearly visible.	Completed
18	Warning tape on either side of the recess channel for the doors to the sheds needs to be renewed.	Completed
19	Safety operating instructions for the drill press and bench grinder need to be established and displayed with appropriate PPE being available.	Completed
20	Regular checks of the first aid kit need to be conducted to ensure that no out of date contents are left in the kits.	Accepted. Procedures amended to implement scheduled checks
21	Instructions for the Weed Hornet and the incubators need to be updated. The security of fire extinguishers in the vehicle cabins needs to be reviewed.	Accepted. Corrective measures established.

Recommendations		Status/Progress
22	The emergency procedures guide relating to radio procedures and dangerous goods spills need to be urgently reviewed and updated.	Accepted. Documents to be updated immediately.
23	A warning sign should be placed on the stairs to the raised storage area indicating that there is low headroom.	Accepted. Corrective measure determined and will be implemented.
24	The formal operating instructions for the high-pressure water wash should be developed.	Accepted. Corrective measure determined and will be implemented.
25	The water tank and water drums on site should be clearly labelled as to th status of their contents.	Completed
26	The emergency shower needs to be regularly tested to ensure that water runs required and the eye wash bottles located in the chemical store need to be k date.	Completed
27	The trip hazard located adjacent to the toilet access needs to be ground down this safer.	Completed
28	Install additional power outlets in the Laboratory area for the freezers and m "Do not unplug"	Request with building owners
29	Bring Testing and Tagging up to date across the whole organisation	Request with DAFF property section
30	Develop formal operating instructions for ovens, fume cupboards and CRYO c	Accepted. Corrective measure determined and will be implemented.
31	Consider supplementary ventilation separate from air conditioning to enal evacuation from laboratory in emergency	Completed
32	Replace broken chair in laboratory	Accepted. Replacement chair ordered.
33	Consider range of cleaning products used in laboratory and obtain MSDS for confirmed as being required	Completed
34	Label cupboards as to contents in laboratory	Completed
35	Create record of testing of Eye Wash station	Accepted. Test record to be posted to station.
36	Implement quarterly safety checklist for laboratory	Completed
37	Update all MSDS (highlight expiry date to make this more obvious)	Completed
38	Move recycling bin from in front of fire extinguisher	Completed
39	Dispose of surplus and out of date equipment in store room, including old first	Accepted. Review & disposal task allocated.
40	Develop signage for large containers current in store room	Accepted. Signage in preparation
41	Reinforce correct storage of chemicals in Flammable Substances Cupboard	Completed
42	Secure equipment in workshop so that it can be used and provide ap instructions and PPE	Accepted. Corrective measure determined and will be implemented.
43	Replace all first aid kits in field vehicles with up to date ones and place them o review cycle.	Completed
44	Rewrite emergency evacuation plan for building	Department Progressing
45	Have landlord bring testing and tagging of all fire appliances into line with Australian Standard	Completed
46	Review all indicated documents as per observations.	Accepted.

Annex 4: Action Plan - YTBN Helicopter Risk Report Recommendations

	Helicopter Risk Report Recommendations	Progress report
	Rec#01: APLC Commissioners issue policy and guidance regarding APLC risk management including levels of acceptable risk and position accountabilities. This should encompass the concept of a common approach to risk management by the APLC and its constituent State organisations.	A risk assessment matrix and definitions for APLC activities and risk decision procedure for APLC risk acceptance was presented to Commissioners in Dec 2011. This needs updating to reflect agreements to date by Commissioners and next steps.
	Rec#2: APLC formalise the requirement to refer and adhere to APLC aviation and general operations policies and procedures by referencing them in the RFT and contracting processes.	Completed under: RFT 10.4(a) and Deed of offer 2.1 (b) & 3.3 (e) and will be updated during the 2013-14 tender renewal process.
	Rec#3: APLC formalise in the RFT, contracting and subsequent auditing/assessing processes the requirement for each Operator to demonstrate that it has a documented and effective Safety Management System that addresses the APLC tasks and requirements.	Accepted, to be included in the 2013-14 SOA and RFT process
	Rec#4: APLC develop guidance and procedure to ensure formalised and documented trials and assessments of future technologies and techniques that may address APLC requirements.	Accepted, and to be formalised in relevant documents and review each year under OH&S annual report
	Rec#5: APLC actively seek out and encourage new technologies, and help develop them in order to conduct APLC aerial operations and presenting minimal risk to its personnel.	
	Rec#6: This risk assessment should be considered by the APLC Commissioners as to whether it meets the organisation's and its constituent State organisations' risk profiles.	Completed Presented to and accepted with minor comments from APLC State Commissioners.
	Additional Recommended Risk Controls	
1	Operator has been checked to ensure that it has had an Air Operating Certificate endorsed for Charter and low level aerial load Operations for at least 5 years.	Accepted: Will be managed through the new Request for Tender (RFT) and Deed of Standing Offer Arrangements (SOA)
2	APLC contracting requires the Operator to demonstrate that it has an effective Safety Management System that includes required elements of accountability, risk management, etc	
3	Operator has been assessed by the APLC to ascertain that it has not had an accident attributable to maintenance or operational management in the previous 5 years or if it has, it can demonstrate that suitable actions have been taken to address any identified or perceived deficiencies.	
4	APLC require the operator to report all occurrences as part of the safety management of the contract and services.	
5	Operator is checked by the APLC to ascertain that its senior management staff can demonstrate competent management of low-level training, operations and safety.	
6	APLC reviews as part of the auditing/assessing process the Operator's and senior management history, operational and safety management systems.	
7	APLC investigates any occurrences to ascertain operator continued compliance and conformance with regulations and APLC requirements.	
8	APLC reviews prior CASA audits to 5 years to establish any non-compliances/conformances that may impact aircraft safety/ performance.	
9	Pilot has had no accidents involving poor decision making or mishandling of the aircraft in the previous 5 years and 1000 flight hours unless adequate rectification and supervision demonstrated and assessed as appropriate.	
10	Pilot has undergone any aircraft-specific safety courses if available (e.g. Robinson safety course).	

11	Operator has a robust training and checking system to ensure aircraft is handled properly and proper decision-making encouraged.	
12	Maintenance Organisation have a trend recording system to detect potential failures in systems before they actually occur.	
13	Operator charges appropriate charter rates to ensure company has sufficient resources to properly maintain aircraft including replacement of components.	
14	Maintenance Organisation is checked to ensure that only approved parts are likely to be used on the aircraft.	
15	Maintenance Organisation is checked to ensure the major maintenance is conducted in controlled environmental conditions to help assure maintenance is conducted in clean conditions.	
16	Maintenance Organisation 5-year history is reviewed for prior inappropriate maintenance standards. Review should include review of CASA audits and the RFT should reflect the requirement for prior audits to be available for review.	
17	Operator and Maintenance/fuel Supply Org have correct published procedures for the storage, security, testing and dispensing of fuel.	
18	Operator and Maintenance /Fuel Supply Organisation have appropriate management cultures that continually audit and assess the operating procedures and practices for conformance and continual improvement including ensuring conformance with fuel industry standards (consider ASTM, JIG).	
19	Operator and Maintenance Organisation keep proper records of fuel uplift and filter replacements to identify potential poor sources of fuel.	
20	Operator and Maintenance/Fuel Supply Organisation have effective maintenance and fuel supply Procedure/Quality Manual and complies with that manual.	
21	Operator and Maintenance /Fuel Supply Organisation checked to ensure that proper testing of fuel is conducted and records kept.	
22	Operator has operating and effective Safety Management System to ensure any fatigue events are captured and analysed to ensure effective remedies are put in place.	
23	Pilot is to remain above 500ft Above Obstacles unless descending to conduct task, conducting task or departing from task.	Accepted Standard Operation Procedures and Aviation Procedures Manual to be updated from 300ft above obstacles to 500ft
24	APLC requires Operator to conduct task no lower than 20ft above obstacles within 250 metres laterally of the helicopter.	Under consideration. If this recommendation is accepted it will need to be assessed operationally to determine its impact on the ability to find locust swarms and accurately delineate a target area.
25	APLC requires Operator to prepare, where practical, hazard maps for operations below 500ft AO in the designated area.	Area hazard mapping and identification is already part of AMF 01 - Operational Briefing Checklist
26	Where practical Pilot obtains brief from landowners and others about potential hazards before operating below 500ft AO.	As above
27	APLC requires property owners to provide a diagram of the HLS or ALA including surrounding obstacles and wires (to the LCC- delete) for on-forwarding to the pilot.	Accepted but where practical only. Add to Operations Manuals
28	APLC requires Operator to make vertical takeoffs and landings to avoid flying into unseen wires (must have sufficient power margins to do so). Same as 43	Draft update Sched 4 Att 1 (35)
29	APLC specifies the use of helicopters with more-modern design standards (post-1970 FAR 27) or demonstrated equivalence to better withstand ground impact. The helicopter history would have to demonstrate impact survivability.	Needs assessing and acceptance from Commissioners and assessment of availability
30	APLC complies where practical with the requirements of NSW Workcover “Work Near Overhead Powerlines Code of Practice”.	Use as guide only and also include AAAA's wire avoidance guide. Add to APLC doc's
31	APLC specifies that no operations are to occur with any part of the helicopter protruding into vegetation (e.g. long grass).	Add to SOP's and Manual

32	Operator has adequate published guidance and training to pilots on the handling of malfunctions and emergencies.	Draft update RFT 10.4(h), Sched 4 Att 2 (9)
33	Pilots have specific training and experience for operations at low level (which includes the handling of malfunctions and emergencies at low level).	Covered under RFT Sched 4 Att 4 Table 1. Additional draft update RFT 10.4 (q & r)
34	Pilot history reviewed for any occurrences in the previous 5 years that indicate poor pilot decision making or poor aircraft handling.	Draft update RFT Sched 4 Att 2 (12)
35	Pilots undergo CRM training to ensure that they can potentially work with crew during an emergency or malfunction.	Additional draft update RFT Sched 4 Att 2 (13)
36	APLC require pilot to have undergone Emergency check ride with in the month prior to commencing operations.	Draft update RFT Sched 4 Att 2 (11). Also upon final acceptance, add to Pilot acceptance checklist and RFT
37	APLC specifies that the helicopters shall be equipped with 4-point harnesses rather than lap-belts.	Updated wording RFT Sched 4 Att 1 (13). Currently required for front only. Modifications for rear seats are available in Bell 206 and will be preferred but can't be mandatory at this stage.
38	APLC requires Operator to have polices, procedures and guidance requires that pilots assess power margin availability in-flight.	Draft update RFT Sched 4 Att 1 (34)
39	APLC requires Operator to have properly operating training and checking system in place that checks that power margins are being applied.	
40	APLC details power margin requirement in RFT.	
41	APLC requires Operator to have published procedures that include reconnaissance requirements before making approach to pad.	
42	APLC requires Operator to ensure adequate power margins before arrival.	
43	APLC requires landings to be vertical from a safe height into pads to ensure clearance from unseen obstructions and wires on the approach. Same as 28. For sites that aren't a recognised airport or heliport.	Draft update RFT Sched 4 Att 1 (35)
As the APLC is a relatively small organisation and to reduce the auditing burden on contractors and parties sharing helicopter resources, a common audit scope for recommendations 1-22 should be developed between APLC and relevant State member departments		

Annex 5: 2012 APLC Strategic Review recommendations

Extract from final report "A strategic review of the Australian Plague Locust Commission (APLC)" by Dr Ron Glanville, Biosecurity Advisory Services, July 2012

List of Recommendations

Mandate, Policy and Area of Operations

Recommendation 1. The mandate of the APLC should remain largely unchanged, but the wording of the memorandum of understanding (particularly the charter) should be modified to reflect the Commission's broader intelligence gathering role, its strategic monitoring & control functions and the provision of technical advice to stakeholders. These documents should also be reviewed to ensure consistency with the intent of the Intergovernmental Agreement on Biosecurity.

Recommendation 2. The APLC should implement its control operations based on defined criteria rather than geographic boundaries, with the primary focus being on early intervention to minimise the build-up of populations that may impact on agriculture and/or the community across more than one State.

Governance

Recommendation 3. The governance of APLC should be strengthened through establishment of a two level committee structure as follows:

(a) a "National Plague Locust Management Committee" (the Commissioners) composed of representatives who have authority to make decisions on behalf of their agencies and who could form better linkages into the national biosecurity system, and
(b) a lower level, more technically based committee ("Consultative Committee on Plague Locusts"), similar to the existing committee, would be maintained to support the APLC Director on more routine operational issues.

Recommendation 4. The governance of APLC needs to be resolved, particularly with respect to:

- clarifying its legal status as an operating entity,
- decision making rights and responsibilities of the investors,
- regulatory authority of APLC staff under state legislation,
- the liability status of its Commissioners in relation to OH&S and the future implementation of low level aerial operations.

Recommendation 5. The APLC should continue to place a high level of priority on planning and research & development that addresses environmental concerns associated with aerial application of insecticides.

Communications

Recommendation 6. The APLC should develop and implement a revised communications strategy, including a revised website, aimed at improving stakeholder understanding of locust management in areas such as the roles of agencies, major locust control decision criteria, the science of locust control and performance of the locust monitoring & management system.

Resourcing and Budget

Recommendation 7. The principles used in formulating the APLC budget, including the accumulation and use of the reserve fund, should be reviewed in the light of structural and procedural changes suggested in this review.

Science

Recommendation 8. A revitalised review, planning and leadership process should be applied to the APLC science program, with a strategic focus on the three key areas of control agents, environmental stewardship and population ecology.

Recommendation 9. The APLC should make a strategic investment in updating its key information systems, particularly those that support monitoring and forecasting and, where practicable, capture and document important corporate knowledge and unpublished research results.

Operations

Recommendation 10. In the event of a major locust plague, or where such a plague appears imminent, coordinated management, combat planning and integrated operational procedures should be implemented between APLC and all affected jurisdictions, more in line with other national biosecurity emergency response arrangements.

Recommendation 11. The current general approach by APLC to conducting control operations is supported, but a more cooperative approach with state and other agencies should be adopted to increase flexibility & operational capacity, including a national approach to training, joint training & operations, provision of technical advice and reciprocal service delivery.

Recommendation 12. The APLC Director should develop a workforce plan that addresses issues discussed in this report, including new skills & roles, job enrichment, succession planning and staff retention.