AUSTRALIAN PLAGUE LOCUST COMMISSION

ANNUAL ACTIVITY REPORT 2012-13

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.

Contents

Figures

Tables

Annexes

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 2012-13

Mr Tom Aldred (Chair) [1]
First Assistant Secretary
Biosecurity Plant Division
Department of Agriculture, Fisheries and Forestry - Australia
GPO Box 858 Canberra ACT 2601

Mr Greg Plummer [2]
Director, Risk Assessment Section
Department of Sustainability. Environment, Water, Population and Communities
GPO Box 787 Canberra ACT 2601

Mr Barry Kay
Director, Biosecurity Operations
NSW Primary Industries
Locked Bag 21 Orange NSW 2800

Mr Gordon Berg
Plant Biosecurity Science Coordinator
Plant Biosecurity and Product Integrity, Biosecurity Victoria
Department of Environment and Primary Industries
Private Bag 15 Ferntree Gully Delivery Centre VIC 3156

Mr Mark Ramsey
Principal Policy Officer
Biosecurity South Australia
Primary Industries and Resources SA
GPO Box 1671 Adelaide SA 5001

Mr Kevin Strong
Manager Operations
Invasive Plants & Animals
Biosecurity Queensland
GPO Box 4267
Brisbane QLD 4001

Director

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

Notes:
(1) Mr Aldred replaced Dr Colin Grant as Chair of APLC Commissioners in April 2013.
(2) Mr Plummer retired in December 2012. A replacement Commissioner representing the Australian Government environment agency has yet to be identified.

Review of 2012-2013

The 2012-13 locust season was remarkably similar to the 2011-12 season, with limited locust populations evident throughout the APLC area of operations. Consequently, no areas warranted control activity by the Commission in 2012-13. The Commission continued with its ongoing regime of surveillance activity to ensure that no undetected locust population was developing which could later create an unexpected upsurge. This also ensured that Member agencies and other stakeholders could remain confident in the intelligence being provided by APLC regarding the current situation.

The lack of control activity during the season reduced the extent of training and development which could be undertaken by both new and experience staff, but did allow for the organisation of several group training exercises, as detailed in this report.

Due to the absence of control activity in the 2011-12 financial year, APLC started the 2012-13 financial year with a healthy balance in the Reserve Fund. By agreement of all Commissioners, it was determined that most of the funds in excess of $3 million would be applied to reducing the contributions required from Member agencies while still allowing APLC to maintain a full annual budget allocation. While this obviously represents an appropriate and timely use of surplus funds, Member agencies must remain fully aware of the expectations this practice can establish. Once the Reserve Fund drops below the agreed “holding point” of $3 million, a return to full contributions will be required from all Member agencies, which Commissioners will need to be well positioned to explain.

A number of planned governance and strategic activities were delayed during 2012-13 due to the reduced availability of the APLC Director. From August 2012 until April 2013, I was requested by DAFF to undertake management of the staff and functions covering national plant health and pest response in addition to maintaining my role as APLC Director. These additional responsibilities significantly reduced the time available to progress strategic and governance issues for APLC, hence the delay in achieving some of the previously-scheduled progress in areas such as implementing the action plan in response to the 2012 APLC Strategic Review. Having relinquished these additional responsibilities in April 2013, I have returned my full attention to APLC matters and will resume the intended progress of these key issues.

In June 2013, discussions were initiated with ESRI Australia to scope options and pathways for redevelopment of the Commission’s Geographical Information System and its monitoring and forecasting system. The proposed redevelopment and integration of these into one comprehensive new IT system is in line with the Strategic Review recommendation regarding redevelopment of these systems, but was brought forward in response to the increasing and significant restrictions APLC was facing due to changes in the DAFF IT systems and security requirements. ESRI Australia have since been commissioned to define the scope of the various system elements currently utilised by APLC and provide design options for an integrated system which will enable APLC to run a seamless GIS, monitoring and forecasting system which will allow continued access to critical information such as locust distribution, weather, vegetation and insect monitoring radar results which was being compromised by new DAFF IT system requirements.

The issue of risk management and liability exposure for APLC and its activities remains prominent for both Member agencies and the APLC Director. Multiple sets of legal advice over the past 10 years reinforces the nature of APLC being an unincorporated joint venture between the Member governments, meaning that liability for APLC is joint and several between those Members. When linked to the obligations of recently-enacted national Work Health and Safety legislation, this puts more onus on the APLC Director and Commissioners (as designated representatives of the Member governments) to participate in decision making regarding risk management. In response to the proposed action plan addressing recommendations from the 2012 Strategic Review, Commissioners agreed not to seek yet another set of legal advice regarding the status of APLC, but to focus on obtaining advice regarding risk management and WH&S legislative compliance, with a possible revision of the current APLC risk policy consequent to that advice.
Along with other actions to be undertaken in responding to the Strategic Review recommendations, this issue will be progressed by APLC management in 2013-14.

Preliminary forecasts for the 2013-14 locust season indicate that there is unlikely to be a significant locust population present for at least the first half of that season. While APLC will maintain its monitoring and forecasting functions in order to meet the expectations of its investors, this situation should allow for the dedication of further time and effort to address strategic and governance issues during the coming year.

Chris Adriaansen
Director APLC

September 2013

Locust situation

Australian plague locust

Overview

In South Australia, localised high density adults persisted in the Jamestown–Burra area of Northeast South Australia during autumn. This small infestation was the only known area in eastern Australia where some high density nymphal development was expected during spring. Hatching commenced in mid-October and produced a number of small bands in the Mt Bryan–Hallett and Orroroo–Jamestown areas (Figure 1). Fledging of nymphs in mid-November resulted in local increases in adult densities from mid-November.

Locust numbers remained low in all other regions during spring, apart from localised increases to medium density adults in parts of the New South Wales Riverina and Southwest Queensland in late November. These increases were primarily the result of fledging of the spring generation of nymphs and aggregation of adults in response to localised storm rainfall.

During December, two small areas of medium-high density young adults developed following fledging of localised nymphs in Northeast South Australia, but no swarm formation occurred and adult numbers subsequently declined. Medium adult densities were recorded in parts of the Riverina and Far Southwest New South Wales, Southwest and Central West Queensland during December and January (Figure 2). These localised small increases in adult numbers were maintained by sporadic low density breeding. Elsewhere in these and other regions locust densities remained very low during summer. Despite rainfall in some areas during December, there was no detected aggregation and high density breeding during summer. The extreme high temperatures during January resulted in dry habitat conditions and are likely to have limited adult breeding and caused nymphal mortality in many areas.

Several moderate-heavy rainfall events in western Queensland and New South Wales during February provided suitable habitat conditions for locust breeding and occasional low density nymphs were identified at several locations in Southwest and South Central Queensland during March (Figure 3). Localised high density nymphs developed in the Gilgandra–Collie area of Central West New South Wales in March, resulting in a number of swarms in mid-April. Medium density adults were subsequently identified in other parts of the eastern Central West region. This was the third successive year in which there was no recorded gregarious population development in arid or semi-arid regions of inland eastern Australia.

New South Wales

Adult numbers remained very low in all surveyed regions during September and October 2012. Low density nymphs were identified in only a few locations in the Central West and the northern Riverina. Lachlan Livestock Health and Pest Authority (LHPA) staff carried out control of a small area of nymphal bands east of West Wyalong at the start of November, with subsequent surveys indicating low population densities in the surrounding area. There was an increase in adult numbers in the Hillston–Booligal–Gunbar area of the northern Riverina, extending west to Mossgiel, in late November (Figure 1). Adult numbers remained low in other regions during December, but medium density adults were identified in the Broken Hill and Ivanhoe districts of the Far Southwest region, along with low density nymphs near Menindee and Balranald.

During January adult numbers declined in all regions, with only residual medium density adults in the Hillston–Booligal–Gunbar area, but no nymphs were detected despite rainfall where higher density adults were recorded at the start of December.

Population densities remained very low during February and March, with the exception of the eastern part of Central West LHPA, where, following a report, localised high density late instar nymphs were confirmed on a property in the Gilgandra–Collie area (Figure 3). At the start of April, this locally produced population formed a number of swarms of young adults. In mid April high

density adults and small swarms remained in that area and a proportion of females were developing eggs. There were also high numbers of the eastern plague grasshopper (*Oedaleus australis*), which were mixed with locusts and contributed to densities of some swarms. Medium density adults were subsequently identified more widely in the Coonamble and Molong districts of Central West region. LHPA assisted landholders in some ground control of swarms and no high density autumn egg laying was reported.

Queensland

Locust population levels remained generally low throughout 2012-13, reaching medium density during different months in localised areas of Central West, Southwest and South Central Queensland. Surveys during spring identified low density populations in the Southwest, Central West, South Central and Central Highlands regions. Low density nymphs developed between Quilpie and Tambo in October and produced medium density adults in northern Quilpie and Barcoo Shires and parts of Blackall-Tambo and Longreach Regional Council areas during November and December (Figure 1). The population was maintained by several periods of local breeding, following storm rainfall in these regions during October, November and again in mid-December.

The overall low population density in most regions continued during January, but medium density adults and occasional early instar nymphs were recorded near Davenport Downs in Diamantina Shire. In Central West Queensland, there were consistent low density adults along with low density nymphs at several locations in the Blackall-Tambo Regional Council area, indicating some successful breeding occurred there in the second half of December (Figure 2).

There was heavy rainfall in the second half of February in Central West and parts of Southwest Queensland. In the Southwest region, adult population density remained low, but nymphs at a range of development stages were identified in several locations in eastern Quilpie, Barcoo and Bulloo Shires in late March (Figure 3). In South Central Queensland, medium density adults and late instar nymphs were identified to the west of Augathella in Murweh Shire and at one location in Paroo Shire. Most nymphs were detected in Quilpie Shire, but the autumn distribution extended from near Augathella in the east to Mount Howitt in the west. Population remained at low levels elsewhere in other regions.

Victoria

Locust population levels remained low in Victoria throughout 2012-13, although no APLC surveys were conducted in this state. Population densities remained low in adjacent districts of New South Wales and South Australia, with the exception of a brief increase in adult numbers in part of Northeast South Australia during December, so there was little opportunity for significant immigration into Victoria. An indication of a local low density population was received after reports of occasional adults from the Kerang–Bendigo area in late March and early April.

South Australia

Localised nymph infestations developed at two locations of the Northeast region during spring, following the persistence of high density populations in parts of the region throughout 2011–12 and sporadic swarm egg laying in autumn. Hatchings commenced in mid-October and by the end of the month early instar nymphs were identified at several locations in the Jamestown–Orroroo–Burra area (Figure 1). High density nymphs and small bands developed in the Mt Bryan–Hallett and Yongala–Yatina areas in early November, with only occasional low density nymphs detected in surrounding areas. Fledging produced small areas of medium–high density fledglings from mid-November near Orroroo and in late November around Burra–Mt Bryan. Only low density adults and very few nymphs were detected elsewhere in the Northeast region and population density remained very low in other regions of South Australia during spring.

Adult densities did not increase significantly in the Northeast region during summer, despite fledging of spring generation nymphs and this was likely the result of extended dry conditions and extreme high temperatures during January. Consistent low density adults remained in the southern

Flinders Ranges during February, but very few locusts were identified in the Far North or Northwest regions. The autumn population is likely to have declined to low levels throughout the state in autumn.

Western Australia

High locust densities and swarm egg laying was reported in the in the Ravensthorpe–Jerramungup area of the Southern Agricultural region during autumn 2012, although the adult population extended into parts of the eastern Central Agricultural Region. In spring 2012, sporadic hatchings were reported near Lake King and Merredin in mid-September, and followed from mid-October in the Katanning–Gnowangerup and Jerramungup–Ravensthorpe areas. Surveys by Department of Agriculture and Food staff during the second half of October detected nymphs on a number of properties in the Katanning–Gnowangerup and Jerramungup–Ravensthorpe areas, but few bands developed during November. However, localised summer breeding allowed the persistence of populations and in autumn significant populations were again detected in the eastern parts of Central and Southern Agricultural Regions. During April moderate adult locust activity was reported in the Shires of Lake Grace, Merredin, Bruce Rock and Kellerberrin. Swarm densities were recorded in Nungarin and Muckinbudin Shires and some high density autumn egg laying was likely in those areas.

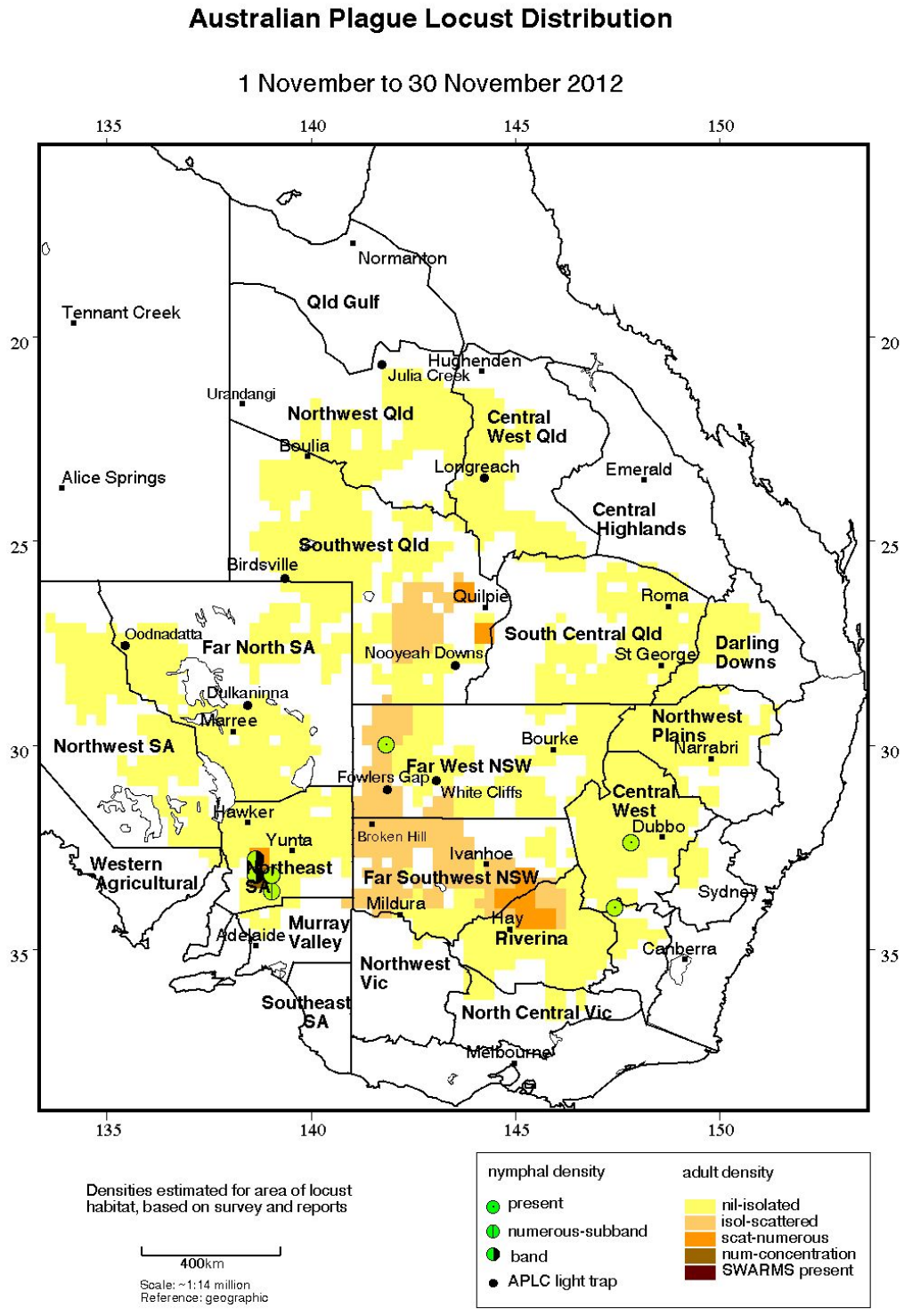

Figure 1 : Australian plague locust distribution in November 2012

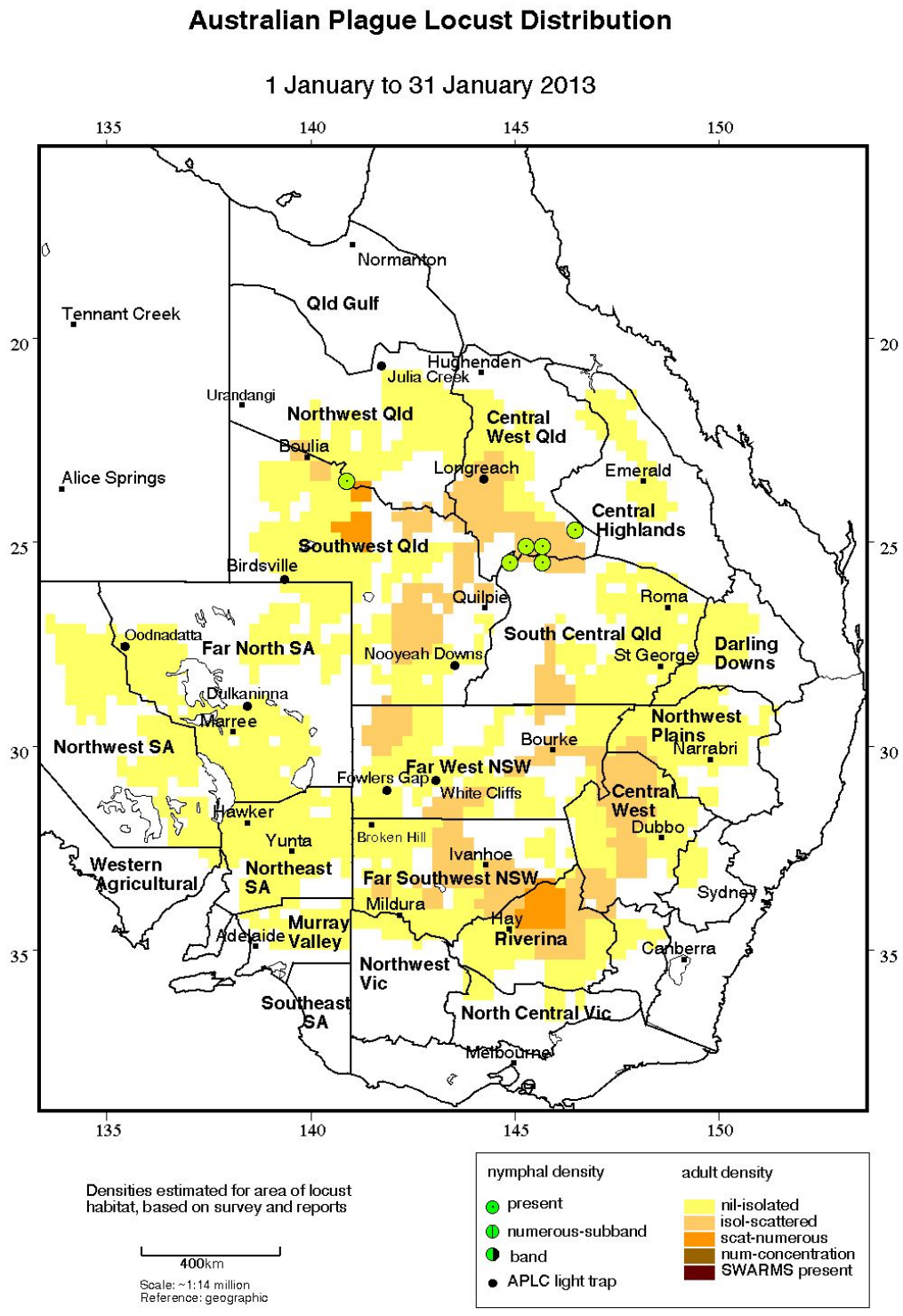

Figure 2 : Australian plague locust distribution in January 2013

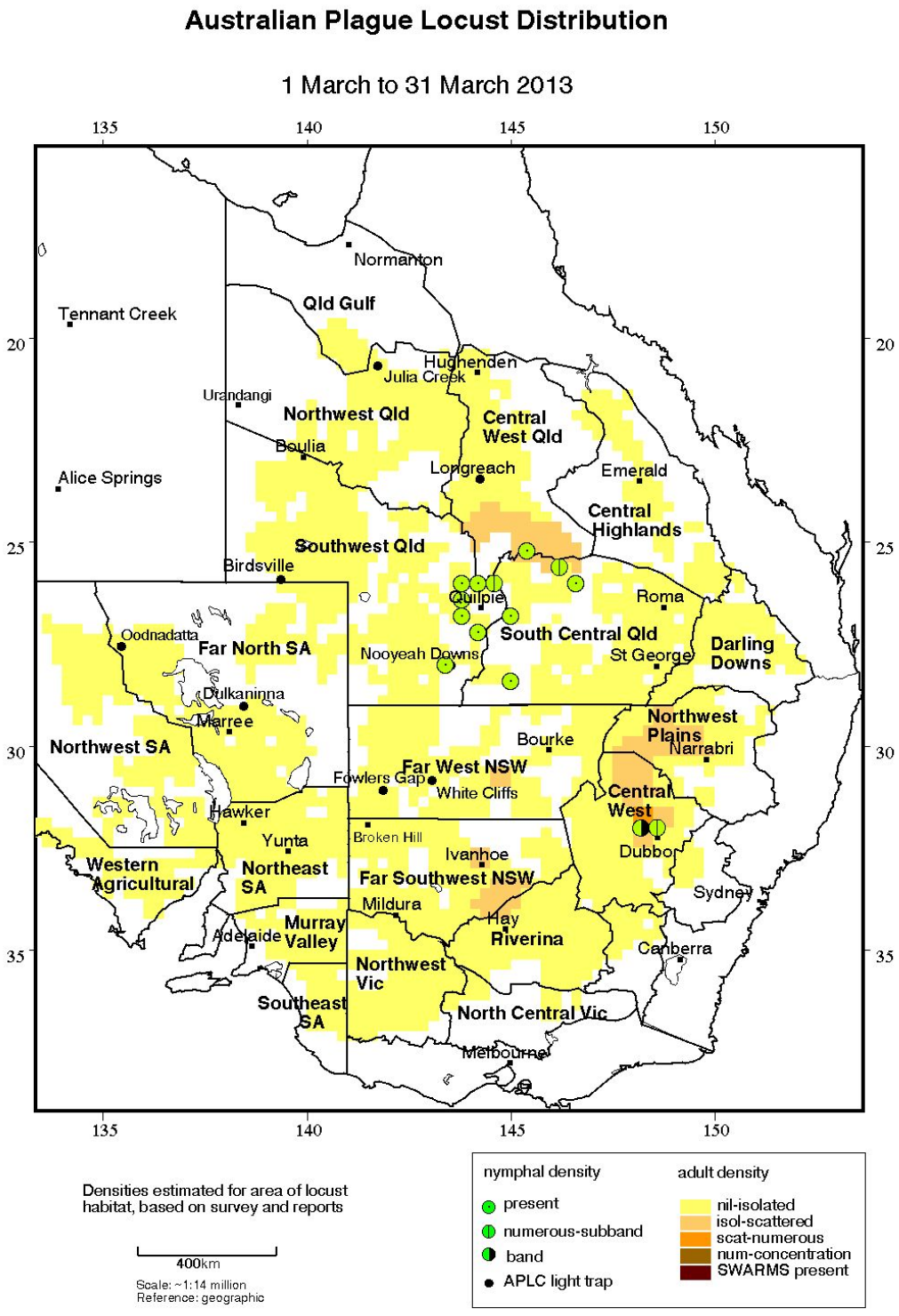

Figure 3 : Australian plague locust distribution in March 2013

Spur-throated locust

Recorded adult numbers remained at low densities throughout 2012-13, partly as a result of a lower than average overwintering population in spring and the weak development of the wet season in Queensland. Surveys during spring identified a widespread low density adult population throughout the inland regions of Queensland and northern New South Wales, but no medium or high densities were detected.

Rains in late October and November provided conditions for the commencement of breeding in Central West and Central Highlands regions, but very few nymphs were detected in early summer. Surveys indicated that adult numbers remained relatively constant in Queensland and declined in New South Wales during summer. Throughout summer, only occasional low density nymphs were detected at very few locations, indicating limited successful breeding occurred. As a result there was no detectable autumn population increase that usually results after the fledging of summer nymphs.

Migratory locust

The population level of this species remained low throughout 2012–13, but consistent low numbers of adults persisted in the Central West and Northwest Plains of New South Wales, and in the Central Highlands, South Central and Darling Downs regions of Queensland during the summer months. The overall population in these regions appears to have been higher than in recent years, but no gregarious population development is known to have occurred.

Surveys during November identified low density adults and nymphs at several locations south of Rolleston in the Queensland Central Highlands. Biosecurity Queensland reported the persistence of a low density population in this region during January. In December, a low density adult population was identified in South Central Queensland from Roma to Dirranbandi, near Bourke–Brewarrina–Walgett in the New South Wales Northwest Plains and as far south as Warren in Central West NSW. Low density adults persisted in parts of the Northwest Plains, including the Moree and Narrabri districts, during February and March. In Queensland, surveys detected adults in the Roma–Dalby area of the South Central region, and the Injune–Arcadia Valley area of the Central Highlands. Occasional adults were also identified in the Blackall–Tambo and Barcaldine districts of Central West Queensland in April.

Operations

Forecasting, information and survey

Eight Locust Bulletins were released during the period October 2012 to May 2013. 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, only one interim Situation Updates was required in May 2013.

Field survey for the presence and abundance of pest locust species continued throughout the 2012-13 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 of the University of NSW insect monitoring radars were off-line for various periods during the season. The IMR at Thargomindah airport was not functioning from October until mid-December 2012 due to a faulty computer power supply unit. The IMR at Bourke airport was out of order from mid-January until mid-April 2013, when a replacement transceiver was fitted. Both IMRs detected a few, low-level migration events during the season.

The Bureau of Meteorology's weather prediction model ACCESS (Australian Community Climate and Earth-System Simulator) was updated in December 2012 to include major improvements to model resolution, file sizes and the forecast range. The increased resolution of ACCESS-R from 0.375° (~37.5km) to 0.11° (~12km) and removal of ACCESS-A required some work on APLC's self-developed wind trajectory model. However, the associated file format change demanded a significant amount of work on the script which downloads, manipulates and filters the data files to calculate direction, velocity and temperatures for trajectory simulation. The new APLC's wind trajectory model enables nightly wind trajectories at 6 heights (300 ~ 1800 m MSL) to be automatically calculated each morning (Figure 4).

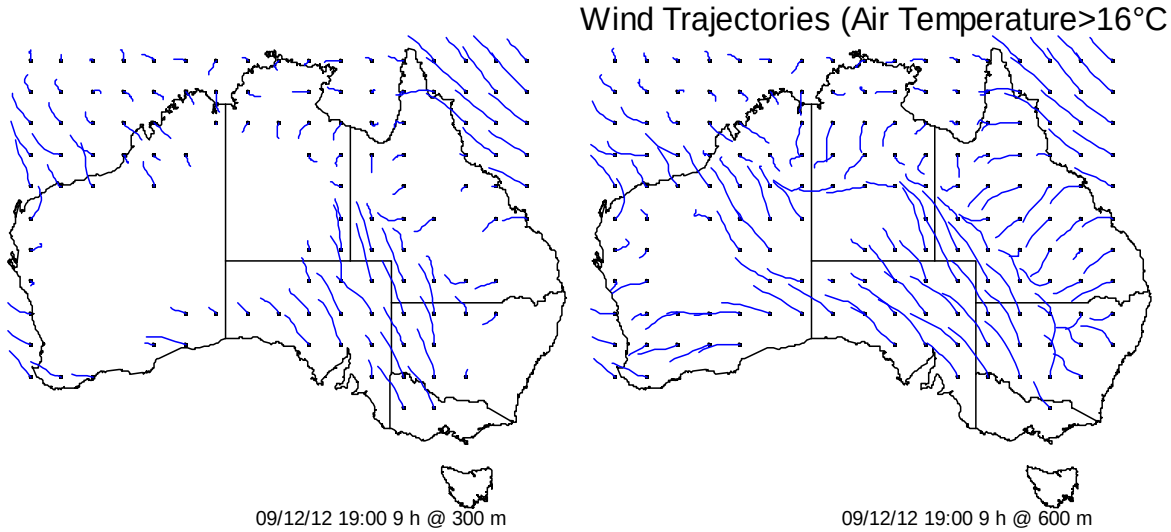

Figure 4 Example of Nightly Wind Trajectories Automatically Generated
(Nine hour forward wind trajectories calculated from 1900 h local time at different MSL)

A three dimensional (3D) wind trajectory model has been developed using BoM ACCESS data to follow any air particle at any height for any duration, backwards or forwards (Figure 5). The model examines the air conditions along any passive migration pathway, representing the environments in which a migrating locust could travel. This 3D model will be primarily a research tool for studying migration events detected by IMR.

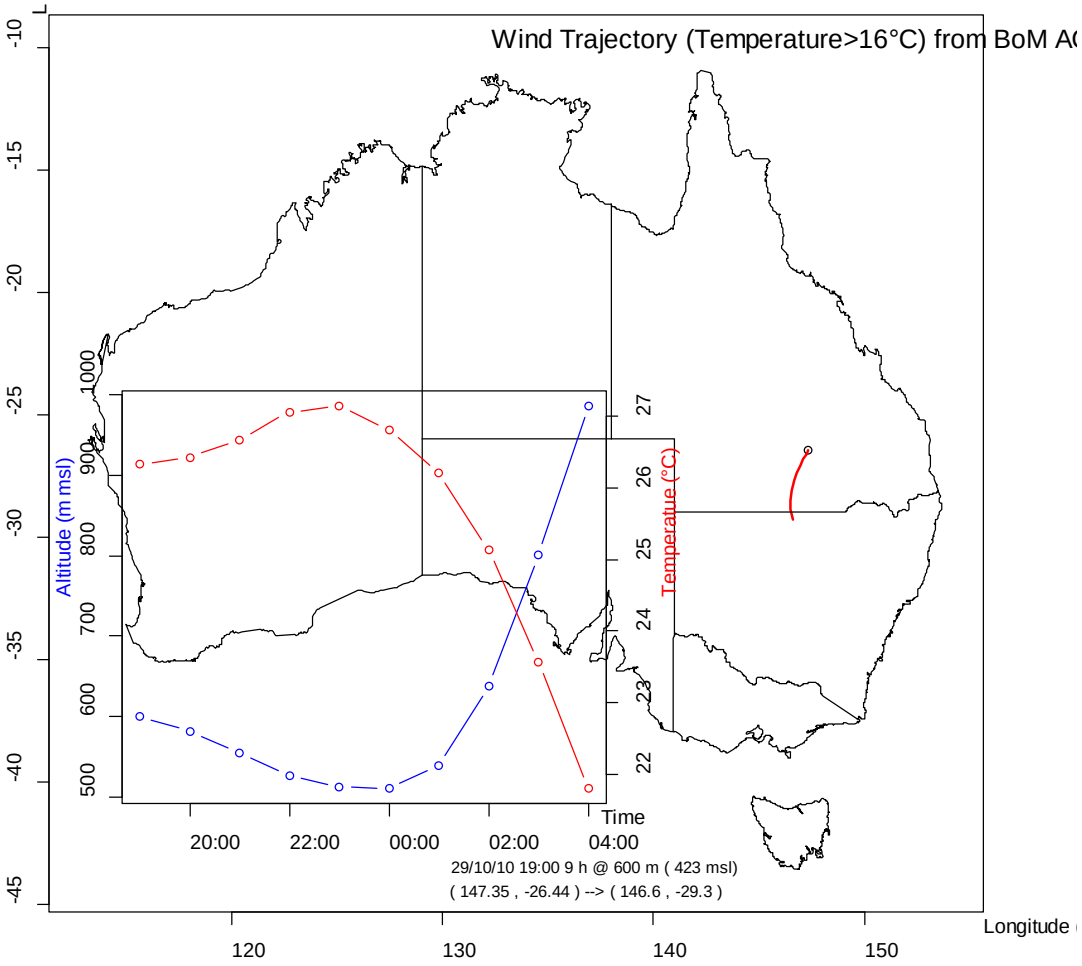

Figure 5 Example of a 3D Forward Wind Trajectory
(Nine hours from 1900h local time at an initial height of 600 m MSL, which is about 175m above the ground level)

Pesticide evaluation and application management

The absence of significant locust populations warranting control during 2012-13 has stalled further work on the evaluation of alternative locust control agents. Following initial discussions held with the Australian agent for the insect growth regulator Dimilin in 2011, the next phase of evaluation for this control agent and the development of an appropriate pattern of use will commence when suitable locust populations develop.

The work undertaken by Peter Spurgin as part of a United Nations Food and Agriculture Organisation (UN-FAO) mission in Tanzania allowed for further development and evaluation of techniques using *Metarhizium* biopesticide.

Control operations and pesticide use

No control activity was warranted in 2012-13 due to the absence of any significant locust populations.

A very limited amount of control agent application as undertaken as part of the longitudinal environmental study which, in collaboration with research partners from University of Wollongong, Macquarie University and Flinders University, is examining immediate and longer term off-target impacts of both chemical and biopesticides used for locust control.
This application was also used as a training exercise for new and recently-engaged APLC field staff who had previously not participated in a locust control campaign.

Table 1: Pesticide application 2012-13

Control Base	*Type*	*Period*	*Number of targets*	*Area Treated (km^2)*
Fowlers Gap, NSW	Research	19-24/2/2013	6	2
Total area 2012 - 13			6	2

Table 2: Area treated (km^2) by pesticide type 2012-13

Fenitrothion	*Fipronil*	*Green Guard*
0 km^2	0.25 km^2	1.88 km^2
(0 %)	(12 %)	(88 %)

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 2012	98.5	24,400	70.43	800
Purchased 2012-2013	0	0	0	0
Used 2012-2013	0	0	3	0
Inventory @ 30 June 2013	98.5	24,400	67.43	800
Approx. equivalent area (hectares)	351,696	221,818	7,931	1,143
Inventory Value @ 30 June 2013	$1,663,665	$409,676	$142,047	$6,400

The total inventory value of the APLC pesticide stocks held as at 30 June 2013 is approximately $2.22 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 at commercial storage 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 [at 4^{o}C] is guaranteed for 2 years but is only guaranteed for approximately 6 months in the field [at 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 as a consequence.
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.

Occupational Health & Safety

There were two reportable incidents during the season which required some ongoing medical treatment.
One staff member incurred a back injury while carrying a 30 kg Engel fridge up some stairs and a second field officer had a minor vehicle accident which resulted in a broken thumb requiring hospital treatment and specialised physiotherapy. Both staff fully recovered after 2-3 months treatment with minimal time off work. Assessment of the causes of the accidents determined no changes to procedures were required but that staff need to continue to be made aware of the procedures in place for carrying heavy objects and to be aware of the effects of fatigue and illness following aerial activities.

Competency based training and assessment

Two new field assistants, Megan Pratt and Danielle McKay, where employed in September 2012 to replace Lauren Beattie and Kate Lightfoot, who resigned in 2012.
The new Field Assistants continued to progress through their first and second seasons of competency based training in all field operations areas, with some restrictions due to the absence of control campaign activities.

11 APLC staff attended the low level helicopter operations competency training held by United Aero Helicopters in August 2012. Staff obtained competencies in :
AVIF3005B - Maintain the safety of people and aircraft
AVIY3052A - Conduct Helicopter Landing Site and Unprepared Helicopter Landing
PUAFIR209B - Work safely around aircraft.

Three officers renewed their training and five additional officers initiated training in the “Fly the Wire” and Crew Resource Management training course run by UAS Australia.

Clare Mulcahy completed a Certificate IV in Training and Assessment and obtained experience as a campaign leader during the aerial spray component of the Fowlers Gap environmental research project.

Five field assistants undertook competency based training in safety around aircraft, fixed wing surveillance and navigation, aerial spraying hazard identification and directing of spray aircraft during the aerial spraying component of the Fowlers Gap research project.

International linkages

During February and March 2013 Peter Spurgin carried out a mission to Tanzania on behalf of the UN-FAO to provide technical assistance to the Tanzania Ministry of Agriculture with the control of an outbreak of Red Locust. This mission follows on from previous UN-FAO missions undertaken by Mr Spurgin, and maintains APLC's profile and engagement on the international scene, which is consistent with the APLC Charter.

UN-FAO also sponsored a three week visit to the APLC during February 2013 by two Locust Officers from the Plant Protection Departments of Uzbekistan and Kyrgyzstan. The focus of this visit was to provide these officers with an understanding of APLC ground and aerial survey techniques and the operational use of bio-pesticides for locust control. Following discussions with APLC research staff in Canberra, Dr Gapparov Furkat (Uzbekistan) and Mr Almaz Alakunov (Kyrgyzstan) joined the APLC field team at Broken Hill and participated in a control exercise at Fowlers Gap.

Administration

Governance

An APLC Commissioners Meeting was held on 17th December 2012 (70th APLC Commissioners Meeting). Commissioners agreed not to hold a meeting in the second half of 2012-13 as there were no issues requiring consideration at that time, other than the 2013-14 APLC Budget, which would not be completed for proposal until after June 2013. Commissioners were provided with quarterly financial performance reports during 2012-13.

Full records of the Commissioners Meeting and all decisions taken are archived with APLC and held by all Member jurisdictions.

Key governance decisions taken by APLC Commissioners in 2012-13 were to modify the existing APLC budget policy, applying the previous arrangement of averaging of the preceding 10 years of actual expenditure on locust control to determine the annual control costs allocation, but modifying the contributions of all investors to each year's budget to reflect the anticipated demand for locust control operations and to maintain the APLC Reserve fund at around $3 million.

Commissioners also considered the draft action plan prepared by the APLC Director in response to the recommendations from the Strategic Review completed in 2012. Particular attention was paid to the issue of risk and liability management, the agreed response action now to focus on a revision of the APLC risk management policy and seeking legal and other advice on how best to manage liability exposure of Commissioners and investing governments which could result from APLC operations.

Staffing

Staffing within APLC HQ and field bases has been relatively stable throughout 2012-13, with two new field staff recruited to fill vacant field officer positions at Broken Hill and Longreach. There was also one transfer of a field officer from Longreach to Narromine. These changes are detailed below. There has also been some change in the part-time ancillary staff employed to manage APLC light traps.

Ms Kelly Arnall transferred from Longreach to Narromine in September 2012.

Ms Megan Pratt commenced as Field Assistant in Broken Hill in September 2012.

Ms Danielle McKay commenced as Field Assistant in Longreach in September 2012

Mr Douglas Ames ended employment as Oodnadatta light trap operator in February 2013.

Ms Megan Pellow commenced duty as Julia Creek light trap operator in March 2013.

Mrs Paula Fraser ended employment as Nooyeah Downs light trap operator in June 2013.

Table 4: 2012-13 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
R.Graham	Officer-in-Charge	Broken Hill	Throughout
N.Green	Field Assistant	Broken Hill	Throughout
M. Pratt	Field Assistant	Broken Hill	From 10/09/12
J.Nolan	Officer-in-Charge	Narromine	Throughout
K. Arnall	Field Assistant	Narromine	Throughout
C.Mulcahy	Officer-in-Charge	Longreach	Throughout
D. McKay	Field Assistant	Longreach	From 10/09/12
R.Knapp	Field Assistant	Longreach	Throughout

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

Finance

Total revenue in 2012-13 amounted to $4.818 million, including a “draw down” of $769,000 from the APLC Reserve Fund. This reduced the funds invested by the Australian and Member State governments to $4.049 million (down from $4.804 million in 2011-12).

Expenses recorded in the 2012/13 period report amounted to $3.448 million resulting in a net operating surplus of $1.370 million. The surplus was carried over to the 2013-14 financial year as part of the accumulated reserve, as shown in the 2012-13 financial performance report *(Annex 1)*. The balance of the APLC Reserve Fund at the start of the 2013-14 financial year consequently stood at $5.003 million. This accumulation of surplus into the reserve fund is in accordance with the Memorandum of Understanding, a position that was reconfirmed by decision of the 62nd Commissioners Meeting in April 2008.

The surplus of income over expenditure for 2012-13 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. A further saving resulted from the realignment of part of the salary of the APLC Director to other Australian Government sources in recognition of the additional branch of the Department of Agriculture, Fisheries and Forestry which the APLC Director managed for 9 months of the 2012-13 year.

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 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 2013-14 APLC budget are likely to reflect the application of at least $1.7 million 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 2012-13 against these are summarised in Table 5.

Table 5: APLC 2012-13 Performance against KPI measures

Key Performance Indicator	KPI Measures	Assessment/comments (2012-13)
Effectiveness of monitoring, prediction and control of locust populations	- Significant populations detected at early-mid instar stage - Accuracy of forecasts of population scale, timing and location - Majority of control measures against nymphal stage - No adverse aerial spraying incidents	- No significant populations were detected in 2012-13, despite extensive scheduled surveillance. Forecast information was appropriately limited, reflecting population levels. No control activity undertaken during 2012-13 Not applicable, as no control activity.
Availability and effectiveness of control agents	- Availability of existing agents - Replacement agents identified and application rates/techniques verified	No change to availability of current control agents. Issues raised in APVMA fenitrothion review are subject to continued discussion with APVMA Ongoing 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	No control agents applied other than as part of longitudinal environmental research project (refer item 2.1 of Research section for detail).
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	Two minor OH&S incidents reported – refer to Occupational Health & Safety report (page 12) for details of incidents and corrective measures proposed.
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.

Table 6: 2012-13 APLC contribution to collaborative research projects

Project title	Collaborators	2012-13 APLC Contribution			2012-13 Total project value (all investors)
		Cash	In-kind	Total	
Ecosystem-wide impacts of various locust control methods	University of Wollongong; Macquarie University; Flinders University	$112,000	$52,000	$164,000	$375,000

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 Identification of alternative control agents

The APLC carries out aerial control of infestations of the Australian plague locust, *Chortoicetes terminifera*, throughout eastern and central Australia. Nymphs and adult swarms are treated using a range of ULV pesticides (fenitrothion, fipronil and the biopesticide Green Guard). In rangeland grazing areas spray targets can be very large (up to 100 km^2) and contain extensive populations of nymphs concentrated in marching groups referred to as bands (20 m up to 5 km in length at densities of 2,000-5,000 nymphs/m^2) that are usually visible from survey aircraft.

Depending on temperature and vegetation conditions bands in these areas can move 50-500 m/day. In this type of situation fipronil (Adonis 3UL) is applied as either an irregular blanket treatment (aircraft spraying in a crosswind) or as a barrier treatment (aircraft spraying parallel to the wind). In both cases a 300 m interval between spray runs is used. These application methods allow large areas to be treated rapidly with high efficacy as banded nymphs moving through sprayed areas are controlled effectively by direct contact or as they feed on or come into contact with treated vegetation (observed mortalities of >95%, 7-10 days after spraying).

Diflubenzuron (Dimilin OF60) is an insect growth regulator pesticide that is used successfully overseas (USA and Africa) for control of locust and grasshopper nymphs in rangeland areas using similar aerial application methods to those employed by the APLC with fipronil. It acts on the immature nymph stages after ingestion of treated vegetation, interfering with the formation of chitin and blocking the normal moulting process between instars. It has proved to have less impact on a range of arthropod and vertebrate non-target species than conventional pesticides. Field trial to evaluate Dimilin as a suitable control agent for APLC aerial control programs and a possible replacement for fipronil are planned when suitable populations of Australian plague locust nymphs occur.

1.2 Pre-lethal effects of *Metarhizium anisopliae* var. *acridum* infection on the Australian plague locust

This study aims to describe and quantify the progression of pre-lethal effects from *Metarhizium acridum* infection in the Australian plague locust using measures of food intake and activity. The experimental design for this work is largely completed and awaiting the opportunity to collect locust eggs from the field.

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.

The APLC is collaborating with the University of Wollongong, Macquarie University and Flinders University to quantify and compare the extent and duration of ecological impacts resulting from applications of the phenyl pyrazole insecticide, fipronil and the biological control agent, *Metarhizium acridum* (Green Guard), on the structure and function of semi-arid grassland ecosystems. Specifically, this project will determine the impact on, and recovery rate of:

(a) Non-target invertebrate assemblages following aerial fipronil and Green Guard applications;

(b) Decomposition and mineralisation processes and those invertebrate and microbial assemblages involved in these processes within treated areas; and
(c) Herpetological assemblages as important insectivores in semi-arid grassland ecosystems as a model predator-prey system.

This project has now entered its second year. Prespray sampling has been completed and treatments (fipronil and Green Guard) were applied to the study sites in February-March 2013. Sampling of non target invertebrate assemblages, herpetological fauna, litter decomposition rates and termite activity is continuing. Quantifying the impact of both fipronil and Green Guard treatments on soil microbial assemblages using BioLof Ecoplates has been completed and the results are given below.

The effect of aerially-applied fipronil and Green Guard on soil microbial assemblages

Decomposition rates are not only dependent on invertebrate activity but also on the activity of soil microbes. The functional activity of soil microbial assemblages can be compared using BioLog Ecoplates. This method provides a metabolic fingerprint of the microbial assemblage, reflecting the variety of carbon sources being used and, broadly speaking, the diversity of microbial functional groups present (but it does not identity the microbial species *per se*). BioLog Ecoplates contain 31 different sources of carbon, with the growth of microbial communities in inoculated plates compared over time using optical density responses and rate of colour change of a tetrazolium dye released in each cell as that carbon source is used. Optical densities of cells are read on a microplate reader at 590 nm through a time series. While many recent studies of soil microbiology have employed molecular fingerprints to assess diversity, the BioLog method is more consistent with our emphasis on understanding ecosystem function.

Comparisons of samples between treatments and times were then undertaken using multivariate analysis. Patterns in Biolog profiles over times and treatments were examined using nonmetric multidimensional scaling (nMDS). Permutational analysis of variance (PERMANOVA) was used to test for differences in treatments over time, Biolog profiles over treatments and time with treatments and time as fixed factors and Site nested within Treatments. All multivariate analyses were done using E-Primer version 6 (Plymouth Marine Laboratory) incorporating the Euclidean distance dissimilarity coefficient. All univariate and multivariate inferential analyses were conducted with significance level (α) of 0.05.

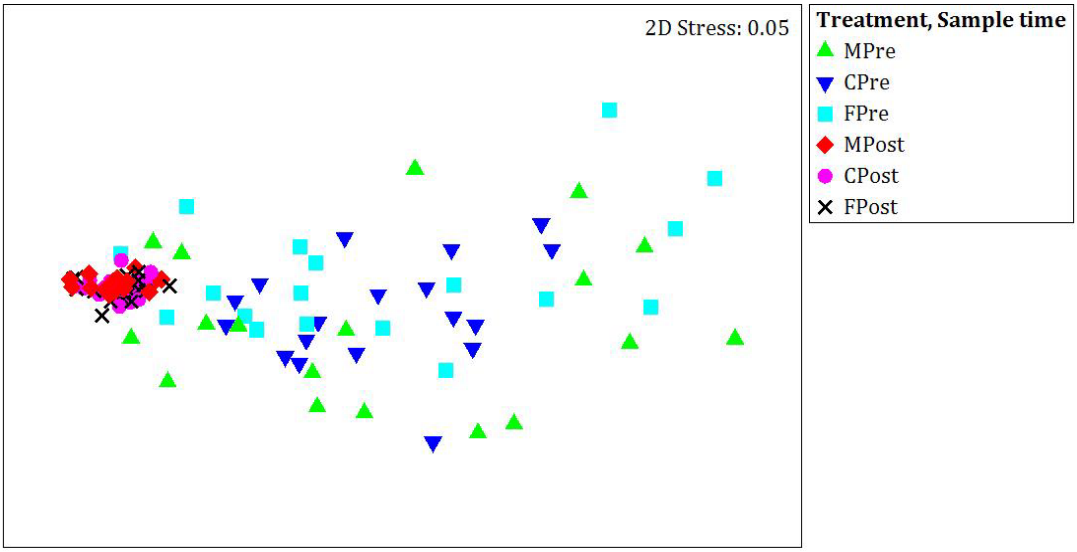

Figure 6. MDS ordination showing Biolog Ecoplate responses of soil microbes before (Pre) and after (Post) exposure to fipronil (F), *Metarhizium anisopliae* var. *acridum* (M) and Controls (C).

Significant differences were identified in microbial assemblages over time (*P=0.001*) but no differences were identified between treatments (*P=0.950*). No significant time, treatment

interactions were found (*P=0.884,* see Table 1). However, statistically significant differences were identified between sites (nested) within treatments (*P=0.002*). Within the Green Guard treatment, a statistically significant difference was identified between site A and I (*P=0.037*), but not between the other sites within this treatment block. No such difference existed between any of the control sites but significant differences were identified between fipronil sites D and G (*P=0.001*) and E and G (*P=0.021*). A full set of comparisons is given in Table 7.

Source	df	SS	MS	Psuedo F	P value	Unique permutations
Time	1	9484.60	9484.60	53.10	0.001	999
Treatment	2	107.63	53.81	0.24	0.950	273
Site (Treatment)	6	1340.30	223.38	2.70	0.002	998
Time x Treatment	2	113.36	56.68	0.32	0.884	999
Time x Site (Treatment)	6	1071.80	178.64	2.16	0.016	999
Residual	90	7440.70	82.67			
Total	107	19558.00				

Table 7. Results of statistical analysis of soil Biolog profiles analysed using PERMANOVA incorporating the Euclidean distance dissimilarity coefficient.

Treatment	Site comparison	P value
Control	B, C	0.080
	B, F	0.172
	C, F	0.239
Metarhizium	A, H	0.148
	A, I	0.037
	H, I	0.377
Fipronil	D, E,	0.220
	D, G	0.001
	E, G	0.001

Table 8. Individual site comparisons (nested within Treatment) using PERMANOVA incorporating the Euclidean distance dissimilarity coefficient.

An absence of statistically significant treatment-related effects in sprayed sites indicates no impact of either fipronil or M. anisopliae on functional assemblages of soil microbes in the arid grassland studied. Changes are evident over time in treated and control sites, an effect likely attributable to rainfall during the application of treatments activating soil microbial communities. Further data on the potential impacts of these locust control agents on the organisms responsible for nutrient cycling will be available at the completion of concomitant studies focussing on invertebrate population level responses, litter and wood billet decomposition and termite activity.

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 in *Austracris guttulosa* as part of a broader objective to improve our understanding of Australian locust population ecology. The first cold tolerance phase of this work is published in the peer-reviewed literature and further work to understand the regulation of development and other aspects of physiological tolerance are planned and pending the availability of field sampling opportunities.

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 first phase of this work 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 now accepted for publication in the peer-reviewed literature (see publication list below). The second phase of this work has assessed *S. fulgidus* parasitism from 23 locust egg bed sites in the New South Wales Riverina over a sequence of three host generations during the 2010–2011 *C. terminifera* plague cycle. Parasitism was locally variable but relatively high in each generation, with >90% egg parasitism during the summer 2010 host generation, exceeding previously reported data. There was evidence to support facultative diapause of up to one-third of *S. fulgidus* larvae in host eggs laid during March–May, with temporal change in proportions similar to diapause incidence in host eggs. This work has now been submitted for publication in a peer-reviewed journal. Further work is planned on other aspects of the life history and reproductive biology of the species.

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: Immersion tolerance of first-instar Australian plague locust nymphs

This study was undertaken as an extension of the egg flooding project above and aimed to quantify the survival of first-instar *C. terminifera* nymphs to range of water immersion periods and temperatures. Planning and execution of the research has been completed and results show that survival is strongly dependent on immersion temperature whereby survival times ranged from time to 50% mortality (LT_{50}) = 8.12 ± 0.26 h at 15˚C to 4.93 ± 0.30 h at 25˚C. These findings suggest that first-instar nymphs would be able to survive most instances of transient, localised pooling of water associated with heavy rainfall in the field. However, flooding that could trap individuals for > 5 h (including nymphs still underground within the egg pod prior to emergence to the soil surface) has the potential to cause high mortality, particularly during summer and early autumn when water temperatures may be high. This work has been prepared and submitted for publication in the peer-reviewed literature.

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

The first stage of experiments to determine the effects of varying amounts of cumulative photoperiod change throughout the lifecycle of *C. terminifera* on diapause initiation has been completed. Results of this work will have direct implications for APLC forecasting and population monitoring and preparation for submission to the peer-review literature is underway.

3.6: 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.

3.7: 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 planned publication will improve APLC's knowledge base and identify important knowledge gaps and priorities for future research.

3.8: 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.

Publications

Deveson, T., Woodman, J.D. In press. Longevity relative to temperature of *Scelio fulgidus* (Hymenoptera: Platygastridae) emerging from Australian plague locust (*Chortoicetes terminfera*) eggs. Australian Journal of Entomology.

Annex 1 : 2012-13 APLC Budget and Financial Performance

Australian Plague Locust Commission
Financial Performance Report
Year-to-date to End June 2013

	2012-13 APLC Endorsed Budget	Year-to-date Budget to end June 2013	Year-to-date Expenditure to end June 2013	Expenditure Variance to end June 2013
Expenses				
Employee Remuneration	1,503,308	1,503,308	1,290,000	213,308
Superannuation	285,663	285,663	251,000	34,663
Leave Expense	184,268	184,268	141,000	43,268
Staff Training And Development	15,294	15,294	17,000	-1,706
Total Employee Expenses	**1,988,533**	**1,988,533**	**1,699,000**	**289,533**
Insecticide Expensed	138,000	138,000	0	138,000
Bio-Insecticide Expensed	252,000	252,000	0	252,000
Helicopter Charter	24,000	24,000	0	24,000
Fixed Wing Aircraft Charter	116,000	116,000	0	116,000
Aerial Spray Aircraft Charter	94,000	94,000	0	94,000
Aviation Fuel	12,000	12,000	0	12,000
Control Ops: Equipment & Freight	38,000	38,000	0	38,000
Control Ops: Travel	52,000	52,000	0	52,000
Sub-Total: Control Operations	**726,000**	**726,000**	-	**726,000**
Light Trap Operations	10,000	10,000	7,000	3,000
Other Technical & Field Expenses	35,000	35,000	28,000	7,000
Vehicles	345,000	345,000	183,000	162,000
Travel	182,000	182,000	233,000	51,000
IT, Communications & Office Equipment	167,000	167,000	155,000	12,000
Contractors & Research Costs	245,000	245,000	180,000	65,000
Other Administrative	15,000	15,000	3,000	12,000
Offical Hospitality	10,000	10,000	-	10,000
General Office Supplies	2,000	2,000	4,000	2,000
Purchase Publications & Data	2,000	2,000	-	2,000
Production Of Publications	2,000	20,000	2,000	18,000
Property & Accommodation	75,000	75,000	71,000	4,000
Memberships & Conferences	2,000	2,000	-	2,000
Consultancy Services	28,000	28,000	-	28,000
Public Relations & Marketing	10,000	10,000	-	10,000
Legal	2,000	2,000	-	2,000
Total Supplier Expenses	**1,132,000**	**1,150,000**	**866,000**	**284,000**
Sub-Total: Salaries + Control Ops + Supplier Expenses	3,846,533	3,864,533	2,565,000	1,299,533
Depreciation & Amortisation	113,381	113,381	38,000	75,381
Corporate Expenses - Government Process	124,577	124,577	102,000	22,577
Corporate Expenses - Business Overheads	715,509	715,509	743,000	27,491
Interest Expense	-	-	-	-
Total Write-down of assets	-	-	-	-
Total Other Expenses	**953,467**	**953,467**	**883,000**	**70,467**
TOTAL	4,800,000	4,818,000	3,448,000	1,370,000

Revenue	
Commonwealth	1,538,767
Member States	1,538,767
Commonwealth: Additional Funding For Overheads	539,022
Member States Additional Charge - Overheads	414,445
Misc Revenue: Reserve Draw-down	769,000
Total Revenue	**4,800,000**

Reserves At Start Of 2012-13 Financial Year	**3,633,000**

Cost Sharing of Endorsed 2012-13 Budget

Member Jurisdiction	%share	Core Contribution	Govt Process Overheads	Overheads Contribution	TOTAL
Commonwealth	50.0%	1,538,767	124,577	414,445	**2,077,789**
New South Wales	32.5%	1,000,198		269,389	**1,269,587**
Victoria	10.0%	307,753		82,889	**390,642**
South Australia	5.0%	153,877		41,445	**195,321**
Queensland	2.5%	76,938		20,722	**97,661**
					4,031,000

Annex 2: Environmental Management System conformance 2012-13

Program	Sub-project	Progress (2012-13)
1. Excellence in all operational areas	Staff trained to full field competence	Two APLC field assistants resigned during 2012 and were replaced by two suitable ranked candidates from the 2011-12 recruitment process. Although no control operations occurred during the season, all new staff received training in safe helicopter operations with UAS Australia and United Aero Helicopters. Training in fixed wing aerial operations was also provided to new staff during the aerial spraying component the Fowlers Gap Environmental Research project. New staff continued to progress through their first and second season of competency training in all other areas of field operations.
	DGPS used in all aircraft	DGPS used during the Fowlers Gap aerial spraying project.
	Improved control efficiency	5 field staff received training in the aerial application of Green Guard and Fipronil.
2. All waste managed appropriately	Waste management contract	Minimum waste was generated during the Fowlers Gap project, however staff received training in clean up procedures and waste delivered to Narromine for temporary storage prior to appropriate disposal
3. Minimise the intensity, extent and duration of disturbance to native flora and fauna	Incidents effectively managed	Not applicable, as no control activity undertaken
	Reduce the proportional use of fenitrothion in control ops	Not applicable, as no control activity undertaken
	Increased successful use of fipronil and larger track spacing	Not applicable, as no control activity undertaken
4. Contribute to our understanding of natural and managed ecosystems	Develop risk assessment process for APLC pesticides, based on outcomes of environmental research.	The Australian Research Council's Linkage funded Program to quantify the comparative effects on ecological processes of two locust control agents used by APLC (the chemical pesticide fipronil (Adonis 3UL) and the biopesticide *Metarhizium anisopliae* var. *acridum*) continued in 2012-13, with the spraying component of project completed in February 2013. Monitoring of termite activity, invertebrate population responses, soil nutrient turnover, litter decomposition rates and predator-prey interactions to continue over the following year.
	Develop field protocols based on research	Relevant research results still pending.

Program	Sub-project	Progress (2012-13)
5. Avoid disturbance to protected sites/areas	Development of the GIS, OpsManager® and PDA handhelds sensitive area maps and database	Review of upgrade options for OpsManager and surveillance software on PDA handhelds continuing.
	Procedures and buffers developed to avoid disturbance	No change necessary
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	Not applicable, as no control activity undertaken

Annex 3: Occupational Health and Safety Management System (OHSMS) Review 2012-13 – 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 Asses process	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 base remote procedures	Awaiting clarification prior to identifying action
13	Improve the comprehensiveness of the reporting arrangements in relati the OHSMS	Accepted. OHSMS will be revised to incorporate
14	Develop a more comprehensive approach to internal audit and inspecti process at 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 a potable status of their contents.	Completed
26	The emergency shower needs to be regularly tested to ensure that wa freely if required and the eye wash bottles located in the chemical store be kept up to date.	Completed
27	The trip hazard located adjacent to the toilet access needs to be grou to make this safer.	Completed
28	Install additional power outlets in the Laboratory area for the freezers a these “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 cylinder	Accepted. Corrective measure determined and will be implemented.
31	Consider supplementary ventilation separate from air conditioning to fume 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 M each one 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 adjacent 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 aid kit	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 Cupb	Completed
42	Secure equipment in workshop so that it can be used and provide app 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 regular review cycle.	Completed
44	Rewrite emergency evacuation plan for building	Department Progressing
45	Have landlord bring testing and tagging of all fire appliances into l relevant 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 to establish a risk policy. This policy is being reviewed in light of recommendations from the 2012 APLC Strategic Review.
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 formalise 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.	Recommendations 1-22 accepted and 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.	

Helicopter Risk Report Recommendations		Progress report
8	**APLC** reviews prior CASA audits to 5 years to establish any non-compliances/conformances that may impact aircraft safety/performance.	Recommendations 1-22 accepted and will be managed through the new Request for Tender (RFT) and Deed of Standing Offer Arrangements (SOA)
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 aircraft 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 relevant Standard Operating Procedures and Aviation Procedures Manual will be updated to change wording 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 it's impact on the ability to find locust swarms and accurately delineate a target area.

Helicopter Risk Report Recommendations		Progress report
25	**APLC** requires **Operator** to prepare, where practical, hazard maps for operations below 500ft AO in the designated area.	Area hazard mapping (where practical) and hazard identification is undertaken by APLC staff during landholder consultation and ground assessment, with aircrew and pilot provided details as 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.	
27	**APLC** requires property owners to provide a diagram of the HLS or ALA including surrounding obstacles and wires for on-forwarding to the pilot.	
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 RFT 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 aircraft 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 available for rear seats in Bell 206 will be preferred but not 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		