Australian Government

Land & Water Australia

Land & Water Australia
Annual Report 2008–09

knowledge for managing Australian landscapes

Australian Government
Land & Water Australia

Land & Water Australia (statutorily the Land and Water Resources Research & Development Corporation) is a statutory corporation established under the *Primary Industries and Energy Research and Development Act 1989* (PIERD Act), within the Australian Government's Agriculture, Fisheries and Forestry portfolio. The Corporation focused its activities on the four objects of the PIERD Act:

1 achieving the sustainable use and sustainable management of natural resources

2 increasing the environmental, social and economic benefits to primary industries and the community

3 making more effective use of the resources and skills of the scientific and general community

4 improving accountability for research and development expenditure.

Knowledge for managing Australian landscapes

Our Mission

To invest in knowledge, partnerships, innovation and adoption to underpin sustainable natural resource management.

Our Vision

The sustainable use and management of natural resources for the benefit of primary industries and the Australian community.

Australian Government
Land & Water Australia

13 October 2009

The Hon Tony Burke MP
Minister for Agriculture, Fisheries and Forestry
Parliament House
Canberra ACT 2600

Dear Minister

Land & Water Australia — Annual Report 2008–09

I have pleasure in presenting to you the Annual Report of Land & Water Australia for 2008–09. This report has been prepared in accordance with the *Primary Industries and Energy Research and Development Act 1989* (particularly Section 28), the *Commonwealth Authorities and Companies Act 1997*, and the *Commonwealth Authorities and Companies (Report of Operations) Orders 2008*.

In the past year, Land & Water Australia has continued to achieve on its mandate to invest in and manage knowledge for sustainable and productive landscapes. This report outlines those ongoing achievements generated from the Australian Government's core funding of $13 million, leveraged with partner funds to $30 million.

Since receiving your letter transmitting the budget decision to cease appropriation funding for the Corporation, the Board and management have put in place and are implementing plans to wind-up the Corporation. We are confident that this will be successfully completed by 31 December 2009, as per your instructions.

Yours sincerely

Anthea Tinney
Chair
Board of Land & Water Australia

Contents

1. Summary and highlights

1.1 Executive summary

Land & Water Australia (LWA) is one of 16 rural research and development corporations which were created to foster innovation in Australia's agricultural production systems. However, while the other 15 corporations focus on particular industries, Land & Water Australia's unique charter was to invest in generating and managing new knowledge for sustainable and productive agricultural landscapes. Its portfolio, in 2008–09 as in previous years, ranged across key challenges to both the productivity and sustainability of Australia's land and water resources; research and knowledge management to improve Australia's capacity to meet the challenges of climate variability and change, food and water security as well as water management and planning, declining soil quality, and weeds, among others. It built capacity among regional managers of land and water resources, and provided the opportunity for our most eminent scientists to pause, consider, and record the findings from their life's work. It studied social implications of sustainability and productivity issues, and the impact of institutional arrangements. It found strong links between Indigenous health and involvement in management of land and water. Highlights of the year's research and knowledge management activities are listed later in the report.

New return-on-investment analysis undertaken during 2008–09 demonstrated that Land & Water Australia's research portfolio continued to deliver significant benefits to sustainable productivity of Australia's land and water resources, far in excess of the cost of the research to LWA and its partners. Return-on-investment analysis has found that, through the years since it was created in 1990, the benefit-cost ratio of Land & Water Australia research has steadily increased.

Land & Water Australia was a leader in the collaborative efforts of Rural Research and Development Corporations (RDCs), working collaboratively with 64 program-level partners in 2008–09, including all the other RDCs, and portfolio departments from every state and territory in Australia, as well as the Australian Government.

Through the year Land & Water Australia's research programs and management of knowledge for adoption more than met the key targets set in its *Annual Operational Plan 2008–2009*. Achievement against individual targets is set out in the sections reporting on our research investments.

In April 2009 the Minister for Agriculture, Fisheries and Forestry, the Hon. Tony Burke, advised that a significant savings measure in the Commonwealth budget was to be a cessation of appropriation funding for the Corporation. Since that time, the Corporation has focused on an orderly wind-up of its affairs, with a view to ceasing all operations by 31 December 2009. LWA initiated negotiations with other agencies to take over existing research programs and projects. Selected collaborative programs will be continued after novation to other agencies, with other programs that were dependent on LWA funding being closed. The fate of individual programs and projects is detailed in the report. All staff were given notice of involuntary redundancy.

Independently of the Government decision on cessation of LWA, the Chairman of the Corporation for the past eight years, Mrs Bobbie Brazil, whose term as Chairman covered more than 40 per cent of the Corporation's 19-year life, retired from the position on 30 June 2009. Mrs Brazil was appointed Chairman in July 2001, and reappointed in 2004 and 2007. During her term, the organisation grew substantially in the amount of research under management and in its impact; it improved its focus on sustainable agriculture and on end-users through strong adoption practices and the significant partnerships that were a hallmark of Land & Water Australia; and it improved the efficiency and effectiveness of its supporting structures and systems. Members of the Board of LWA express their deep appreciation of Mrs Brazil's contribution over such an extended period.

Members of the Board also thank the staff of Land & Water Australia, who have been so professional, passionate and tireless in their efforts to ensure an orderly wind-up that maximises the significant legacy of 19 years of investment. Further, the Board acknowledges the important work of so many researchers over the Corporation's life who have truly made a difference to the sustainability and productivity of Australian landscapes.

1.2 Highlights of the year

Land & Water Australia made substantial advances during 2008–09 in generating new knowledge and managing it for adoption to improve the sustainable productivity of Australia's land and water resources. In fields as diverse as water management and planning, irrigation, weeds, agroforestry, biodiversity, fire, climate, impacts of social issues and institutional arrangements, tropical rivers, and soils, LWA programs have identified opportunities for more-sustainable production and engaged stakeholders in dialogue to further take-up of the new knowledge.

Return-on-investment analysis of 630 LWA research projects (more than 25 per cent of LWA projects completed since 1990) shows a steady increase in benefit-cost ratio over the years (from 4.1 to 1 in the early years up to 5.92 to 1 in later years), with analysis in 2008–09 of outcomes from a Senior Research Fellowship on groundwater finding a benefit-cost ratio from the individual project of more than 47 to 1.

Not only did LWA continue in 2008–09 to lead development of Australia's *Climate Change Research Strategy for Primary Industries*, but its *Managing Climate Variability* and *Innovation* research programs also made substantial advances in understanding of climate issues, their impacts on the production of food and fibre as well as rivers and biodiversity, and both mitigation of and adaptation to climate change.

The *Knowledge for Regional Natural Resource Management Program* built the skills of land and water managers in regions across Australia, while LWA's management of the redevelopment of *Australian Agriculture and Natural Resources Online* facilitates the transfer of scientific knowledge and data to land and water managers, policymakers, and scientists.

Through its research programs LWA collaborated with 64 program-level partners across Australia in 2008–09, many of the partners engaging with LWA in multiple programs. Program-level partners included all other Rural Research and Development Corporations, portfolio departments of every state and territory as well as the Australian Government, CSIRO and the Bureau of Meteorology, local government, universities and water corporations. LWA worked with many other partners at project level.

As detailed elsewhere in the report, with the closure of LWA many research programs or projects have been or are in the process of being passed to other agencies to manage. With the exception of some projects scheduled to be completed early in 2009–10, all other LWA programs or projects have been or are in the process of being curtailed or terminated.

Highlights during 2008–09 included:

- *Managing Climate Variability Program* continued to foster improvements to *Predictive Ocean Atmospheric Model for Australia* (POAMA), Australia's dynamic model of climate, one of eight climate change models included in reports and analysis by the Intergovernmental Panel on Climate Change. International progress in forecasting and climate change predictive science is underpinned by such models. The genesis of POAMA was funded under *Climate Variability in Agriculture*, the precursor to *Managing Climate Variability*.

- *Managing Climate Variability Program* also co-designed and then invested in a CSIRO–Bureau of Meteorology partnership to ascertain what were the key climate drivers or influences for the various regions of Australia, and how these climate drivers manifested through synoptic features. Through analysis of rainfall across the 180+ years of Australia's climate record, and correlation to the drivers of Australia's climate region by region, this project was able to define the major influences or drivers of climate attributes, such as rainfall, spatially and temporally across Australia. The project also evaluated the key gaps in POAMA adequately representing these climate drivers.
- The *Soil Health Knowledge Bank* website (soilhealthknowledge.com.au), launched on 22 June 2009, was established to help farmers safeguard an important cornerstone of farm business: their soil. The *Knowledge Bank* provides farmers with a range of locally relevant soil health guides, assessment tools, detailed case studies, and education and training materials that will help improve soil management. Healthy soils are vital, both for promoting the health of plants, animals and humans, and for supporting profitable farming and growing regional economies. The *Knowledge Bank* builds on the results of the *Healthy Soils for Sustainable Farms Program* funded by the Department of Agriculture, Fisheries and Forestry with support from the Grains Research and Development Corporation and managed by Land & Water Australia. More than 30,000 people received general information about healthy soils and their benefits during education, training and information activities run by LWA; and 17,000 farmers, advisors, extension and natural resources management staff took part in workshops, field days and soil assessment training.

- The partners to the *National Climate Change Research Strategy for Primary Industries* (a collaboration of all rural R&D corporations, CSIRO, the Australian Government Department of Agriculture, Fisheries and Forestry, and all state and territory governments, and managed by Land & Water Australia) agreed in-principle in March to an extension to the program for a further five years. The importance of this nationally coordinated effort is clear for leading Australian primary industries into sustainable and profitable practices in the face of climate change, in terms of both adaptation and mitigation.

- Drs Mark Stafford Smith and Greg McKeon, both LWA Senior Research Fellows, were co-recipients of the Ecological Society of America 2009 Sustainability Science Award for their co-authorship to an award-winning Special Feature on Land Change Science in *Proceedings of the National Academy of Sciences* (PNAS December 26, 2007, vol. 104, no 52, pp 20690–20695).
- *The House on the Hill: the transformation of Australia's farming communities,* a book written by Dr Neil Barr through his LWA Senior Research Fellowship, was published by Halstead Press. In *The House on the Hill: the transformation of Australia's farming communities,* Dr Barr helps explain the changing face of rural Australia.

- Dr Clive McAlpine's research through the *Innovation Program*, showing that loss of land cover exacerbated droughts in eastern Australia, was a research highlight in the journal *Nature*.
- A national *Environmental Water Allocation Forum,* held by the *Environmental Water Allocation (EWA) Program* in partnership with the National Water Commission, Department of the Environment, Water, Heritage and the Arts and the Murray-Darling Basin Authority, brought together scientists, policy makers and water managers to review and share knowledge about environmental water management and allocation, and to discuss knowledge gaps and future research priorities. The forum included small group workshop sessions and presentations from key researchers in the EWA program.
- Findings of the 2008 review into Knowledge and Adoption activities were implemented to embed management of knowledge for adoption in every phase of research projects and align activities more strongly to the aspirations of the *2005-2010 Knowledge and Adoption Strategy.* Implementation included redevelopment of LWA and program websites, leading to a 75 per cent increase in the average page views per visitor and a 235 per cent increase in average time each visitor spent on the sites.
- The Council of Rural Research and Development Corporations released analysis of return on investment in 36 highly successful projects from across the 16 rural RDCs, of which LWA was one. It found a benefit-cost ratio of 11 to 1 in the projects studied. This analysis follows six years of analysis of return on investment by LWA on projects within its research portfolio over the entire period of its existence.
- According to the third Land & Water Australia stakeholder survey conducted in April 2009, appreciation of the role of LWA has been continuing to increase. The awareness level of LWA has increased significantly since the previous survey (up from 82 per cent to 87 per cent). Perceptions of performance also increased, with a trend of overall performance improving over time. Of the 13 key performance indicators in the survey, nine recorded increases in ratings.

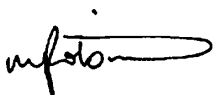
2. Report of Operations

2.1 Certificate concerning the Report of Operations

The Directors of the Land and Water Resources Research and Development Corporation (which is the legislated title of Land & Water Australia) are responsible under Section 9 of the *Commonwealth Authorities and Companies Act 1997* for preparation of the following Report of Operations in accordance with the *Commonwealth Authorities and Companies (Report of Operations) Orders 2008* and the Finance Minister's Orders.

This Report of Operations is made in accordance with a resolution of the Board of Land & Water Australia on 3 September 2009.

Anthea Tinney
Chair



Michael Robinson
Executive Director

2.2 Legislative framework

2.2.1 Enabling legislation

Land & Water Australia was established on 3 July 1990 under the *Primary Industries and Energy Research and Development Act 1989* (PIERD Act).

2.2.2 Objects

The legislated objects of all rural R&D corporations are set out in Section 3 of the PIERD Act. Sub-sections 3 (a) to (c) respectively cover primary industry and community benefits, sustainability of natural resources, and social capital development—equating to the economic, environmental and social components of sustainable development to which the rural R&D corporations direct their efforts. Sub-section 3 (d) encompasses accountability.

Section 3 of the PIERD Act deals with:

- increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries
- achieving the sustainable use and sustainable management of natural resources
- making more effective use of the resources and skills of the community in general, and the scientific community in particular
- improving accountability for expenditure on research activities in relation to primary industries.

2.2.3 Functions

A core function of Land & Water Australia, derived from Section 11 of the PIERD Act, was to investigate and evaluate the requirements of R&D relevant to issues affecting the management of land, water and related vegetation resources and, on that basis, prepare a five year R&D plan, review it annually and revise it if required.

Other requirements imposed by the PIERD Act on rural research and development corporations are to:

- prepare an annual operational plan for each financial year
- coordinate or fund the carrying out of R&D activities that are consistent with the annual operational plan
- monitor, evaluate and report on natural resource management (NRM) research activities
- facilitate the dissemination, adoption and commercialisation of the results of research.

2.2.4 Powers

Section 12 of the PIERD Act grants powers to Land & Water Australia to:

- enter into agreements for carrying out R&D activities
- make applications for patents
- charge for work or services rendered
- accept gifts, grants and bequests, and act as a trustee of money or property vested in Land & Water Australia
- acquire, hold and dispose of real and personal property
- join in the formation of a company.

Over the past year the Corporation has, in accordance with its powers set out under Section 12, entered into contractual arrangements for carrying out R&D activities with and by other persons in accordance with Sections 13 and 14 of the Act. The Corporation has not entered into any new contracts for R&D activities since being advised by the Minister of the cessation of LWA. The Corporation's research investment activity was underpinned by contracts which included milestone schedules. The Corporation used milestone management as one of its key performance indicators in delivering against strategic outcomes.

During 2008–09, the Corporation did not apply for patents for inventions or commercially exploit patented inventions, or grant licences under patented inventions.

2.3 Strategic and reporting framework

The 2008–09 Annual Report is prepared by the Land & Water Australia Board of Directors to meet the requirements of Section 9 of the *Commonwealth Authorities and Companies Act 1997* (CAC Act) in accordance with the *Report of Operations Schedule* of that Act for the 2008–09 financial year and the requirements of Section 28 of the PIERD Act. Among other things, the report reflects Australian Government policies and priorities while covering progress against Land & Water Australia's *2005–2010 Strategic R&D Plan*. It is also required to report against the four objects of the PIERD Act. The broad way in which Land & Water Australia responded to these four objects is described below. More detail is provided in later sections. LWA's *2005-2010 Strategic R&D Plan* outlines three key strategies through which the Corporation would achieve its objectives: Research programs (Strategy 1); Collaboration and strategic analysis (Strategy 2); and Knowledge into practice (Strategy 3). The *Annual Operational Plan 2008–2009* details anticipated outcomes, key performance indicators and targets for programs undertaken under the three strategies. Our most detailed level of reporting is against these performance indicators and targets.

Objective (PIERD Act Section 3)	Corresponding LWA activity
(a) increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries	The Corporation works with primary industries (particularly through fellow RDCs) to increase the sustainable use of natural resources and the profitability of farming systems.
(b) achieving the sustainable use and sustainable management of natural resources	This object encompasses the entire spectrum of the Corporation's business, as prescribed in its mission to build knowledge, partnerships, innovation and adoption to underpin sustainable NRM.
(c) making more effective use of the resources and skills of the community in general and the scientific community in particular	The Corporation makes use of its extensive networks in the general and scientific communities to help in the design, development and implementation of its research programs and projects. There is a specific undertaking to equip present and future land managers, policy makers, educators and others, with the knowledge and tools needed to expand their capabilities in achieving sustainable NRM.
(d) improving accountability for expenditure on R&D activities in relation to primary industries	The Corporation's commitment to accountability includes meeting all statutory obligations in a comprehensive, timely and transparent manner.

2.4 Operating environment

Land & Water Australia continued normal operations through most of the financial year, delivering against its *Annual Operational Plan 2008–2009* and *2005-2010 Strategic R&D Plan*.

In April, the Minister for Agriculture, Fisheries and Forestry, the Hon. Tony Burke, advised the Corporation that a significant savings measure in the 2009 Commonwealth budget was to be a cessation of annual appropriation funding for Land & Water Australia. It could be argued that Land & Water Australia's endeavours created momentum for ongoing improvements in natural resource management across Australia's rural sector, and that natural resource management is now a mainstream issue for the rural research and development community and research funders.

A special appropriation budget for 2009–10 of $6.7 million was secured under the 2009 Commonwealth budget to assist the orderly transition and wind-up of Land & Water Australia's significant investments. Land & Water Australia immediately began an orderly wind-up of its affairs, with a view to ceasing all operations by 31 December 2009.

It ceased to commission new research projects, and initiated negotiations with a range of other agencies to take over existing research programs and projects. At year's end it appeared likely that the Corporation would be successful in transferring to other agencies management of selected collaborative programs which it had been managing on behalf of partners. However, several programs that were dependent almost entirely on Corporation funding were closed. While Land & Water Australia was able to identify mechanisms to enable completion of most existing research projects in the closing programs, it did find it necessary to terminate a small number of projects which had already been contracted.

All members of staff were given notice of redundancy, with almost all to leave LWA by 31 July 2009. A small number of people were to be retained as a wind-up team for varying periods after July, with all to finish by December 2009.

Details of the fate of individual programs are given in the Report of Operations, and the fate of individual projects is included in Appendix 1.

2.5 Financial performance

Total expenditure by Land & Water Australia in 2008–09 was $29.54 million and total revenue was $24.51 million, producing an operating deficit of $5.03 million compared with an operating surplus of $0.17 million in 2007–08.

Revenue for the year was $0.4 million less than forecast in the Corporation's *Annual Operational Plan 2008–2009*. Expenditure was $4.6 million higher than planned. The latter is attributable to increased expenditure on research ($1.7 million), and knowledge into practice ($0.5 million) in addition to unplanned expenditure of $2.4 million directly related to the wind-up of the Corporation.

The equity position of $9.82 million includes $9.71 million set aside for program or project expenditure either as a result of formal agreements with external funding bodies or Land & Water Australia Board decisions leaving $0.11 million in unallocated reserves at 30 June 2009.

The 2008–09 audited financial statements (p.131) show Land & Water Australia received total revenue of $24.51 million, of which external contributions amounted to $10.52 million or 42.9 per cent of total revenue. In 2007–08 the comparable figures for external contributions were $24.43 million or 62.9 per cent of total revenue. Monies from the Australian Government amounted to $13 million or 53.1 per cent of total revenue. In the previous financial year the figures were $13 million or 33.5 per cent.

Interest and other income came to $0.98 million or 4.0 per cent, compared with $1.4 million or 3.6 per cent of total revenue in 2007-08.

Figure 1 shows a representation of the proportion of revenue sources for 2008-09.

During the 2008-09 financial year Land & Water Australia's expenditure was $29.54 million of which $20.81 million or 70.5 per cent was invested in research. Knowledge into practice investment was $2.82 million (9.5 per cent) while portfolio management expenditure accounted for $0.25 million or 0.8 per cent. Administrative costs (including unplanned expenditure of $2.4 million directly related to the wind-up of the Corporation) were $5.66 million or 19.2 per cent of expenditure.

Figures 2 and 3 show the break up of Land & Water Australia expenditure by activity and program, while figure 4 provides a comparison between 2007–08 and 2008–09 expenditure.

Table 1 lists expenditure by both program and strategy.

No developments or circumstances have occurred subsequent to the end of the financial year that will significantly affect the operation's results or state of affairs of the Corporation in the period to 31 December 2009.

Figure 1 Proportion of revenue sources for 2008–09

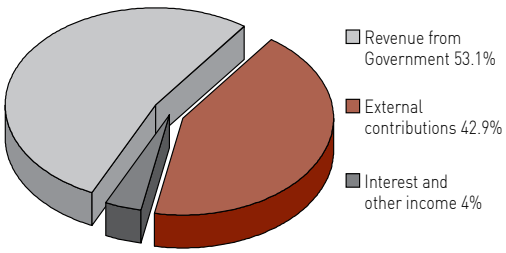


Figure 2 Breakup of expenditure for 2008–09 by activity

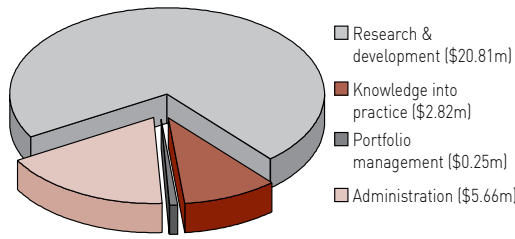


Figure 3 Breakup of expenditure for 2008–09 by research program

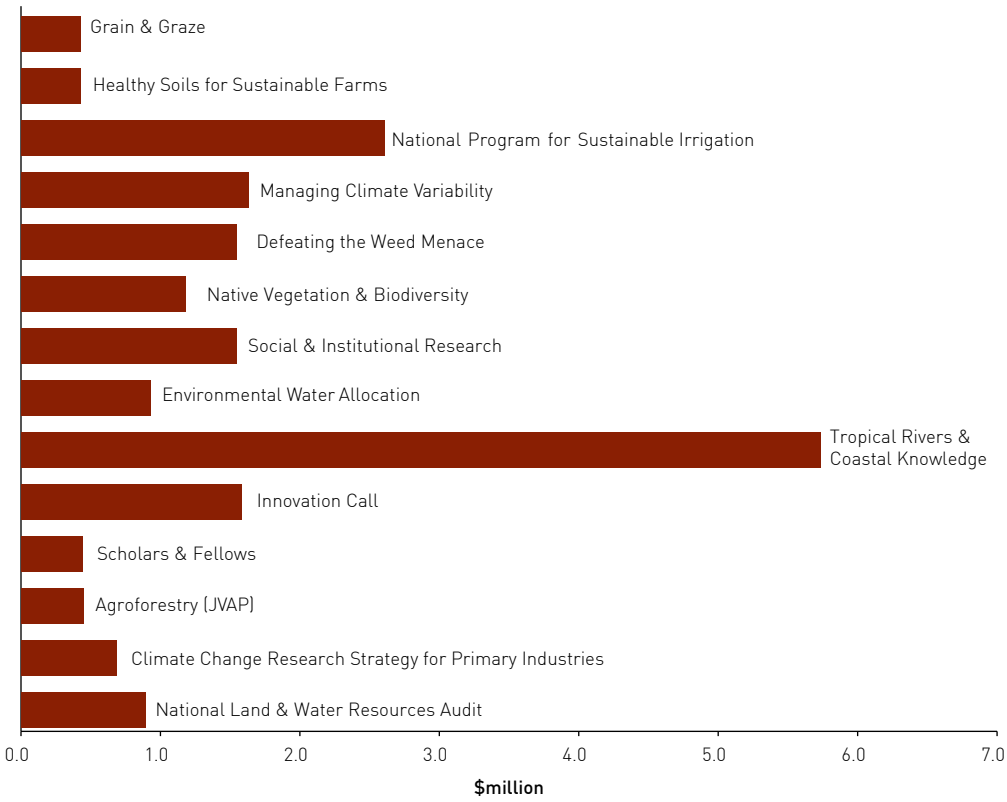


Figure 4 Comparison between 2007-08 and 2008–09 expenditure

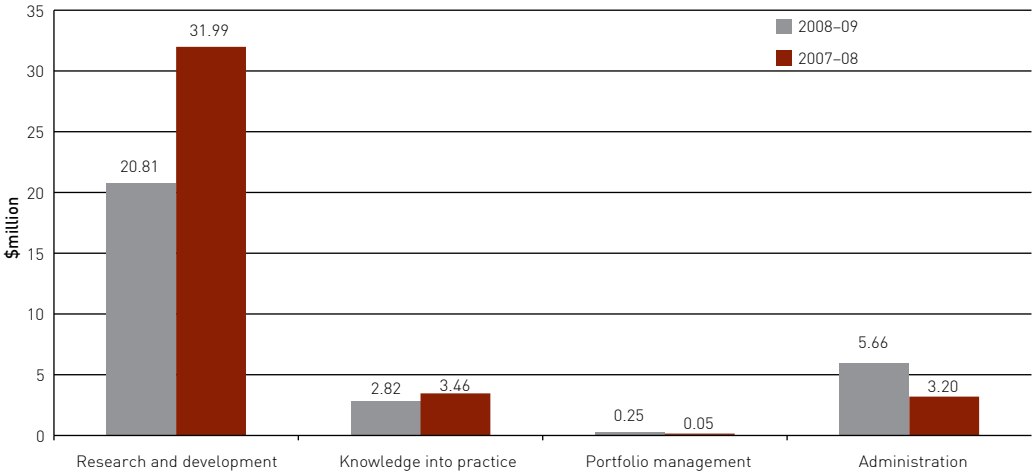


Table 1. Land & Water Australia expenditure by program and strategy 2008–09 ($ million)

Program	LWA	Partners (incl interest)	Program total
Strategy 1 - Research investment			
Grain & Graze	$0.000	$0.426	$ 0.426
National Program for Sustainable Irrigation	$0.500	$2.109	$ 2.609
Managing Climate Variability	$0.500	$1.133	$ 1.633
Climate Change Research Strategy for Primary Industries	$0.000	$0.618	$0.618
Primary Industry Adaptation Research Network	$0.000	$0.070	$0.070
Healthy Soils for Sustainable Farms	$0.025	$0.399	$0.424
Environmental Water Allocation	$0.613	$0.313	$0.926
Native Vegetation and Biodiversity	$0.954	$0.229	$1.183
Defeating the Weed Menace	$0.000	$1.547	$1.547
Joint Venture Agroforestry Program*	$0.450	$0.000	$0.450
Tropical Rivers and Coastal Knowledge	$0.720	$5.011	$5.731
Social and Institutional Research	$0.831	$0.714	$1.545
Innovation	$2.295	$0.001	$2.296
Other**	$0.441	$0.021	$0.462
Total Strategy 1	$7.329	$12.591	$19.920

Strategy 2 - Collaboration and Strategic Analysis			
Partnerships	$0.253	$0.000	$0.253
National Land & Water Resources Audit	$0.000	$0.893	$0.893
Total Strategy 2	$0.253	$0.893	$1.146

Strategy 3 - Knowledge into Practice			
Knowledge and Adoption	$1.780	$0.000	$1.780
Australian Agriculture and Natural Resources Online	$0.008	$0.610	$0.618
Knowledge for Regional NRM	$0.000	$0.426	$0.426
Total Strategy 3	$1.788	$1.036	$2.824

Corporate Enabling Functions* **	$5.656	$0.000	$5.656

Total Investment***	$15.026	$14.520	$29.546

* Managed by the Rural Industries Research and Development Corporation.

**This includes minor expenditure on legacy activities relating to programs which had formally closed and costs associated with administration of some programs.

*** Corporate expenses include $2.372 million directly related to the wind-up of the Corporation.

**** The figures in this table refer to direct cash investment only. Actual investment at the level of research projects is higher again, when project-level and in-kind contributions from research providers are considered. Additionally, Land & Water Australia provides in-kind contributions to research programs through provision of corporate services and management-level support.

2.6 Responding to national and rural research priorities

The Australian Government's national research priorities and rural research and development priorities provide a framework and focus for all of its research agencies. Land & Water Australia's portfolio of investments is intentionally aligned with both national and rural research priorities that are consistent with our mission and vision.

Our primary focus was on national research priority A, 'An environmentally sustainable Australia', especially in relation to water, sustainable use of Australia's biodiversity, and responding to climate change and variability.

2.6.1 National research priorities and their associated goals

Table 2 (p.20) shows Land & Water Australia's expenditure across the four national research priorities in 2008–09. For compliance purposes, this includes information about expenditure for all associated goals, as indicated by a letter and number matching the goal.

Australia's national research priorities are:
A—an environmentally sustainable Australia
B—promoting and maintaining good health
C—frontier technologies for building and transforming Australian industries
D—safeguarding Australia.
Details of these four priorities follow.

A—an environmentally sustainable Australia

1. Water—a critical resource.
2. Transforming existing industries.
3. Overcoming soil loss, salinity and acidity.
4. Reducing and capturing emissions in transport and energy generation.
5. Sustainable use of Australia's biodiversity.
6. Developing deep earth resources.
7. Responding to climate change and variability.

B—promoting and maintaining good health

1. A healthy start to life.
2. Ageing well, ageing productively. Preventative healthcare.
3. Strengthening Australia's social and economic fabric.

C—frontier technologies for building and transforming Australian industries

1. Breakthrough science.
2. Frontier technologies.
3. Advanced materials.
4. Smart information use.
5. Promoting an innovative culture and economy.

D—safeguarding Australia

1. Critical infrastructure.
2. Understanding our region and the world.
3. Protecting Australia from invasive diseases and pests.
4. Protecting Australia from terrorism and crime.
5. Transformational defence technologies.

Land & Water Australia investments in 2008-09 responded to six goals of the first national research priority, an environmentally sustainable Australia. These were:

- water (giving attention to improving water productivity, resource protection and re-use)
- transforming existing industries (including new technologies for resource-based industries)
- overcoming soil loss, salinity and acidity (identifying causes of land degradation and finding solutions)
- reducing greenhouse gas emissions
- sustainable use of Australia's biodiversity
- responding to climate change and variability.

2.6.2 Rural research and development priorities

Table 3 (p.20) details Land & Water Australia's investments against the Australian Government's rural research and development priorities. These priorities complement the national research priorities. As would be expected of a rural R&D corporation with a focus on sustainable production and improving the understanding of natural resources, the highest proportion of investments has been spread across these priorities.

The rural R&D priorities are:

1. *Productivity and adding value.*
   Improve the productivity and profitability of existing industries and support the development of viable new industries.
2. *Supply chain and markets.*
   Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.
3. *Natural resource management.*
   Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable.
4. *Climate variability and climate change.*
   Build resilience to climate variability and adapt to and mitigate the effects of climate change.
5. *Biosecurity.*
   Protect Australia's community, primary industries and environment from biosecurity threats.

Supporting the rural R&D priorities:

1. *Innovation skills.*
   Improve the skills to undertake research and apply its findings.
2. *Technology.*
   Promote the development of new and existing technologies.

2.7 Expenditure across national research priorities and rural R&D priorities

Tables 2 and 3 align total expenditure (excluding $2.372 million directly related to the wind-up of the Corporation and as such not contributing to national or rural R&D priorities) by strategy across the national research priorities and the rural R&D priorities respectively. These priorities are described in the previous section of the report. More detailed information about the strategies within the Land & Water Australia *2005–2010 Strategic R&D Plan* is included in later sections of this report.

Table 2. LWA research expenditure estimates for 2008–09 across National Research Priorities ($'000)

National Research Priorities	An environmentally sustainable Australia							Promoting and maintaining good health			
	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4
Strategy 1											
Innovation	914		131	131	260		392				
People	702	176		88	176		88				
Sustainable Industries	2,454	702	351				2,456				
Sustainable Landscapes	8,906				2,143						
Strategy 2	458	65	65	65	65		456				
Strategy 3	1802	126	73	38	354		455				
Total	**15,236**	**1,069**	**620**	**322**	**2,998**		**3,847**				

Table 3. LWA research expenditure estimates for 2008–09 across Rural R&D Priorities ($'000)

Rural R&D Priorities	Productivity and adding value	Supply chain and markets	Natural resource management	Climate variability and climate change
Strategy 1				
Innovation			1,436	392
People			1,230	88
Sustainable Industries	1,052		2,455	2,456
Sustainable Landscapes	113		11,048	113
Strategy 2			717	196
Strategy 3	156		2,264	435
Total	**1,321**		**19,150**	**3,680**

	Frontier technologies for building and transforming Australian industries					Safeguarding Australia					Total
	C1	C2	C3	C4	C5	D1	D2	D3	D4	D5	
		261			522						2,611
					439			88			1,757
	702				351						7,016
								225			11,274
					130						1,304
	94	35			193			42			3,212
	796	**296**			**1,635**			**355**			**27,174**

	Biosecurity	Supporting the priorities		Other research	Total
		Innovation skills	Technology		
		783			2,611
		439			1,757
		351	702		7,016
					11,274
		391			1,304
		263	94		3,212
		2,227	**796**		**27,174**

2.8 Land & Water Australia 2005–2010 Strategic R&D Plan

The Land & Water Australia *2005–2010 Strategic R&D Plan* (referred to hereafter as the *Plan*) sets out the strategies the Corporation had for fulfilling the four objects of the PIERD Act. The PIERD Act objects are:

- achieving the sustainable use and sustainable management of natural resources
- increasing the environmental, social and economic benefits to primary industries and the community
- making more effective use of the resources and skills of the scientific and general community
- improving accountability for research expenditure.

Land & Water Australia's **vision**, articulated in the *Plan*, is the sustainable use and management of natural resources for the benefit of primary industries and the Australian community. The **mission** is to invest in knowledge, partnerships, innovation and adoption to underpin sustainable natural resource management. The **outcome** is knowledge, understanding and informed debate to inspire innovation and action in sustainable NRM.

The **outputs** of the *Plan* are focused on:

- new knowledge useful to the sustainable management and use of Australia's natural resources
- productive partnerships to support research investments
- tools for improving adoption of the results of research.

2.8.1 Progress against the LWA 2005–2010 Strategic R&D Plan and Annual Operational Plan 2008–2009

Land & Water Australia has identified three goals and three strategies by which progress against the *2005–2010 Strategic R&D Plan* can be assessed. These goals and strategies are described in detail below.

Goal	Progress to date
Generate new knowledge useful to the sustainable use of Australia's natural resources	The generation of new knowledge for sustainable and productive landscapes continues. A total of 220 research projects generating new knowledge operated during 2008–09.
Develop productive partnerships and undertake strategic investment in natural resource management	Collaborations, relationships and partnerships with 64 external bodies brought $10.52 million in external funding to LWA in 2008–09 for investment in R&D
Improve adoption of the outputs of research	Adoption drives the return on LWA's investment in R&D. Levels of adoption continue to improve. Using conservative assumptions, the latest return-on-investment analysis of LWA's investment in R&D found benefit-cost ratios of investment in 11 recently completed projects ranging from 8.1/1 to 47.6/1. Analysis has shown increasing returns on LWA investments, with average benefit-cost ratios rising steadily from 4.1/1 in the early 1990s to 5.92/1 for projects completed more recently.

Key strategies	2008–09 activities
Research investment	The research investment strategy is in four streams of activity, focusing on sustainable industries, sustainable landscapes, social and institutional research, and innovation. A total of 69 new projects were contracted during the year.
Collaboration and strategic analysis	Much of Land & Water Australia's research involves collaborative arrangements at program and project levels. Almost 43 per cent of Land & Water Australia's total funding in 2008–09 came from collaborations and other relationships with external parties (not including substantial in-kind contributions). Strategic analyses ensure research investments are directed appropriately and address current and emerging issues.
Knowledge into practice	Land & Water Australia has continued to make inroads for improved adoptability and applicability of its research programs by embedding management of knowledge and adoption activities into all phases of research, from planning to legacy. Return on investment analysis demonstrates the effectiveness of managing knowledge for adoption activities.

Land & Water Australia's *Annual Operational Plan 2008–2009* included a planned outcome, performance indicator and performance measurement at corporate level for 2008–09.

Planned outcome	Knowledge, understanding and informed debate to inspire innovation and action in sustainable and productive landscapes
Performance indicator	Improvements in the understanding, management and condition of Australia's natural resources which can be linked demonstrably with the adoption of outputs of our research investments
2008–09 Performance measurement	Triple-bottom-line benefit-cost analysis of 11 projects from three significant program areas brought to more than 640 the number of Land & Water Australia research projects subjected to such analysis. This represents more than 25 per cent of Land & Water Australia's completed projects since 1990.
2008–09 Achievement	Detailed benefit-cost analyses were undertaken on 11 projects, using an internationally recognised return-on-investment approach that includes triple-bottom-line reporting. Using conservative methodologies and assumptions, these studies found benefit-cost ratios ranging from 8.1/1 to 46.6/1.

The *Annual Operational Plan 2008–2009* also listed a series of major planned outputs from programs for the financial year. On the following pages, research investments and outcomes for 17 specific programs are presented as illustrations of progress. Outputs are tabulated against planned outputs summarised from the *Annual Operational Plan 2008–2009*.

Appendix 1 lists all projects operating during the year, which may be at various stages. The program highlights which follow show progress against the Land & Water Australia *2005–2010 Strategic R&D Plan* and, where appropriate, how this progress addresses national research priorities and national rural research and development priorities.

2.8.2 Strategy 1: Research investment

Stimulation of new ideas, concepts and technologies has been encouraged across all portfolio areas and was the core business of the *Innovation* arena of investment of Strategy 1.

Through *People*, social values and lifestyle aspirations were investigated, whether they were personal or related to national concerns for the environment. These studies may similarly spread across the total portfolio of investments.

Under *Sustainable Industries*, Land & Water Australia has made investments in programs seeking such outcomes as improved irrigation efficiency, restoration of soil and water health, and implementation of production systems which are appropriate for regional environments.

Under *Sustainable Landscapes*, research has been targeted towards the broader picture, with interests ranging from the future management of Australia's northern rivers, reducing the impact of weeds on extensive farming systems and conservation areas, to understanding native vegetation and how to protect and manage it. Important elements of landscape research were the development of human capacity for regional management and the linking of local level activities with wider regional goals.

Innovation Arena

Innovation Program

Land & Water Australia's *Innovation Program* provided breakthrough research through an annual open call that targeted key land and water resource management problems. Each year the call selected the best researchers from all over Australia to work on specified problems. The program also invested in the next generation of researchers through the *Postgraduate Projects Sub-Program*, fostered international collaborations through the *International Fellows Sub-Program*, and supported major synthesis works such as books and journal articles through the *Senior Research Fellows Sub-Program*. The *Innovation Program* addressed the national need to achieving step-wise advances in management of soil, vegetation, water and biodiversity and foster greater integration. Further information on this program can be found at lwa.gov.au.

With the cessation of Land & Water Australia, most Senior Research Fellowships and supported postgraduates were able to continue through arrangements the Corporation was able to make with host Universities. Some projects nearing scheduled completion were to be managed by LWA to completion. Contracts for a small number of projects were terminated. Negotiations toward some future research contracts were aborted when the cessation of LWA was announced. The fate of all projects is listed in Appendix 1.

Executive Managers

Mr Bruce Wright/Ms Anwen Lovett

Partners

This program collaborated closely with the research community including Australian and state government agencies, universities and private researchers. It also invested in pilot projects, workshops, conferences and other forums to develop collaborative research investment between the research community, policy makers and land and water managers.

Program duration

This program was an ongoing investment of Land & Water Australia under the *Strategic R&D Plan 2005–2010*, with many three-year projects resulting in a pipeline of measurable research outputs and outcomes.

Expected program outcomes

- To develop the capacity of managers through deliberate investment in scientific knowledge needed to manage soil, water, vegetation and biodiversity.
- To provide the people, knowledge assets and technology to solve and ameliorate resource management problems.

Expenditure for 2008–09

$2.296 million (LWA $2.295 million)

Program highlights

- Drs Mark Stafford Smith and Greg McKeon, both LWA Senior Research Fellows, were co-recipients of the **Ecological Society of America 2009 Sustainability Science Award** for their co-authorship to an award-winning Special Feature on Land Change Science in *Proceedings of the National Academy of Sciences* (PNAS December 26, 2007, vol. 104, no 52, pp 20690–20695)
- Dr Clive McAlpine's research, showing that land-cover reduction affected the local climate and exacerbated droughts in eastern Australia, was a research highlight in the journal *Nature* (vol 458, 30 April 2009)
- Dr Neil Barr's book *The House on the Hill: The transformation of Australia's farming communities* was launched by the LWA Chair Mrs Bobbie Brazil in Melbourne on 21 May 2009.

New knowledge

Climate

- Dr Clive McAlpine (University of Queensland) linked climate to land clearing in a series of simulations using the CSIRO *Mark 3* climate model. The team compared regional climate with pre-European and 1990 vegetation cover. Consistent with observed climate trends the simulated annual, seasonal and extreme temperatures were linked to extensive land clearing. The clearing amplifies the adverse impacts associated with El Niño drought periods and extreme temperatures. Broad scale clearing of native vegetation cover has had a strong influence on climate and restoring Australia's native vegetation needs to be a critical consideration in mitigating the effects of climate change.
- Prof. Graham Farquhar's (The Australian National University (ANU)) Land & Water Australia Senior Research Fellowship 2009–10 will formalise the relationship between actual evaporation and evaporative demand in a way which includes the linkage between pan evaporation rate and the evaporative demand imposed on individual leaves and on vegetation. This will enable the improvement in modelling of quantitative comparisons between effects of changes in rainfall on vegetation and those of evaporative demand to grow the understanding of changes in photosynthesis and primary productivity.
- Dr Pauline Treble (ANU and the Australian Nuclear Science and Technology Organisation) used geochemical signals preserved in the layers of cave stalagmites to recover prehistoric information on the variability of Australia's rainfall. This research led to an improved understanding of these signals and their climatic interpretation. The research provided a 600–year long record of rainfall changes in south-western Australia and demonstrated that the same techniques can be used in the Murray-Darling Basin.
- Prof. Peter Gell (University of Ballarat) collected sediment cores from Lakes Purrumbete and Colac that span the past 500 years and are sampled at sufficient resolution to infer inter-annual variability in relative lake level and water quality. There is evidence for a drying event at or before the first European settlement that brought increasing salinity to Lake Colac that was followed by a decline in aquatic plants and an increase in lake algae. Both lakes show increasing salinity, catchment disturbance and nutrient levels. The diatoms in the uppermost samples of both lakes are dissimilar to those below, revealing that the condition of both is presently outside their historical range of variability.

Fire

- Dr Patrick Lane (University of Melbourne) studied the impact of wildfires on catchment water quality following the 2003 fires in northern Victoria. This produced the best-available parameterisation for current Australian water quality models and tested process-based models of erosion and water quality. The highly porous forest soils combined with strong water repellence meant previous models could not be used to reliably predict the highly variable infiltration and runoff generation in burnt catchments. The project contributed to improved models and better informed water management after the Victorian wildfires in 2009.

- Mr Luke Kelly's PhD research (Deakin University) will help manage fire mosaics and mammal conservation in the Murray Mallee region to achieve conservation goals. Fire management is increasingly focused on managing landscapes as mosaics with spatially heterogeneous patches of differing fire history and post-fire age. This research, part of a larger Mallee fire and biodiversity project, provides empirical baseline data and will guide conservation efforts of the Mallee's unique fauna including the Mallee Ningaui, Common Dunnart, Western Pygmy Possum, Bolam's Mouse, Little Pygmy Possum and Mitchell's Hopping Mouse.

Water management

- Prof. Derek Eamus's (University of Technology, Sydney) Land & Water Australia Senior Research Fellowship will provide a review and synthesis of the current understanding of the three-way interactions among water, forests and climate into discussion papers, 'How-to' manuals and decision-support tools. These will be freely available through the LWA website. The products are targeted to water managers, including, for example, Catchment Management Authorities, NRM Boards, water resource planners and managers in state departments, NRM facilitators, and private, state and federal managers and owners of land and water resources. They will be contributions to policy development, policy implementation and policy review.
- Mr Aftab Ahmad's PhD research (Charles Sturt University) will help to reduce the environmental footprint of irrigation by finding the balance between energy consumption, water use and salt loads to aquifers and rivers for different irrigation systems. Modern agricultural practices have led to a dramatic increase in the input of fossil energy, raising concerns over sustainable use of energy resources. Most research into water-use efficiency and management of surface and groundwater focuses on changing gravity-fed irrigation systems to pressurised systems and net recharge management. This project explores the problem in the Murrumbidgee Irrigation Area.
- Ms Ilka Wallis's PhD project (Flinders University) will identify key processes that control the generation, propagation and attenuation of acidity and/or trace metals in contaminated groundwater. It examines the fate of arsenic during deepwell injection of aerobic water into pyritic aquifers. Detailed quantification, understanding and prediction of coupled variable density flow, solute transport and reaction is necessary to understand the impacts that may lead to accumulation/mobilisation of acidity and/or trace metals in water such as over-pumping, artificial recharge and/or climate change.
- Dr Tamie Weaver (University of Melbourne) led a project that gathered evidence and developed a model to ensure fresh water lenses under major rivers are better understood. The multiple analyses have provided major advances in understanding the spatial and temporal patterns of the Nyah-Hattah fresh groundwater lens, its response to changes in rainfall and river levels, and its relationship to the Murray River under flood and low flow conditions. These findings allow predictions of how the lens may grow or decline under varying river regimes that will allow better understanding and management of the connected groundwater and surface water systems in this region.

- Ms Debbie Burgis's PhD research (University of New England) is contributing to understanding the effects of environmental flow releases to restore and sustain the health of the lower Gwydir River. It has developed high-resolution remote sensing techniques to map riverine habitats (in-channel, wetlands, floodplain) and then assign measures of river health associated with changes in river discharge. An empirical model that links flow to habitat inundation and ecological production will be produced to allow environmental flows to be optimised for environmental and economic returns.
- Ms Catherine Choung's PhD project (Macquarie University) is exploring the impact of pesticide mixtures used in agriculture on aquatic ecosystems. The project began with a focus on atrazine and terbufos in concentrations that could be found in rivers and their impact on cladocerans, chironomids and Southern Bellfrogs. The work is testing the toxicity of major breakdown products terbufos sulfoxide and terbufos sulfone. The effects of these chemicals will be studied alone and in mixtures to understand likely scenarios that occur in rivers of irrigation areas.
- Mr Leo Carroll's PhD project (ANU) will assess linkages relating to water resource management and demography in a selection of case study areas in regional New South Wales and Victoria. Water and catchment planning processes are instrumental to Australian water policy. They provide a framework for allocation of water for consumptive and environmental purposes, for management of surface and groundwater systems, for urban water supply, and for land-use policies that affect water quantity and quality. The network of water planning instruments is complex and changing.
- Prof. David Mainwaring's (Royal Melbourne Institute of Technology) research developed new technology that uses a polymer to detect agricultural chemicals in water. Existing costly water quality tests limit the ability of users to reduce undesirable chemical runoff, managers to know the water quality and regulators to reliably detect chemical contaminants. The new technology gives results in real-time, more cheaply and accurately (including at lower concentrations) than the next best technology. The project has also proven a new way to remove these undesirable chemicals from the water and the new technology could revolutionise water quality management.
- Ms Elizabeth Irvine's PhD research (University of Melbourne) will examine the salinity processes in Lake Eyre Basin Rivers. It will contribute to understanding the way salt moves through ecosystems and the processes involved in highly saline environments.
- Mr Andrew Ross's PhD at ANU is examining conjunctive management of surface and groundwater resources to meet human and ecosystem needs. These resources can be managed as single, unconnected or common resources in a coordinated manner to achieve objectives. Conjunctive water management can achieve more efficient and flexible use of scarce water, for example by storing water underground and extracting it when and where it is needed. The research will investigate the barriers to conjunctive water management and explore options for how it can be implemented to improve water management outcomes in the Murray-Darling Basin.

- Ms Melissa Robinson's PhD (Griffith University) project will assess the effect of changes in river flow on downstream primary productivity in a Gulf of Carpentaria river and determine how changes in primary productivity affect productivity in higher trophic levels and the implications of this for species of recreational or commercial interest. It is important to examine the social, economic and environmental costs and benefits of development of northern rivers and this project will examine a key aspect of the effect of modification of river flow.
- Dr Anu Kumar (CSIRO) is seeking to detect and measure the impact of discharges from wastewater treatment plants on ecosystems. Fish populations in the Murray-Darling Basin suffered a major decline in the past 50 years and endocrine disrupting chemicals (EDCs) could be a contributing factor in some regions. Under sustained drought in regional Australia treated effluents are increasingly used for environmental flows as the national and international awareness rises on the impact of organic contaminants such as EDCs. Using the best available techniques this project will detect the impact of these chemicals in three locations. One year's work has been undertaken on this three-year project. At the end of the 2008–09 year LWA was seeking to identify another agency willing to take on management of the project.
- Mr Michael Stewardson (University of Melbourne) was to deliver a basic understanding of the relative effects of land use, regulation and channel hydraulics into a useable synthesis. This was to incorporate land use and hydraulic effects into environmental flow. Assessments like this are a challenging scientific problem because the effects are strongly interrelated. With the cessation of LWA the corporation has had to give notice of the termination of this project one year into its scheduled three-year timetable.
- Dr Larry Barber's (US Geological Survey) Land & Water Australia International Fellowship enabled him to visit Australia for two months and work with Australian researchers, water utilities and policy makers to improve their skills and knowledge about the impacts of using treated effluent as environmental flows. Dr Barber gave presentations to over 200 people in five states during his visit and started what will be an ongoing collaboration between Australian and US researchers.
- Dr Ejaz Quereshi's (CSIRO) project is preparing scenarios of key water policy issues the irrigation sector faces such as water trading, carry-over rules and spatial optimisation under historic, dry, medium and wet flow regimes in the Murray-Darling Basin. The project will help explore relevant policy mechanisms. It will use biophysical-economic models to develop plausible scenarios for economically efficient and environmentally sustainable water management. The model synthesises the latest CSIRO *Sustainable Yields project* hydrological, salinity, agronomic data through an optimisation model to provide scenarios relevant to both state and federal water policy makers and water managers.

Biodiversity

- Prof. David Lindenmayer's (ANU) Land & Water Australia Senior Research Fellowship 2009–10 will be a major synthesis of temperate woodland work, specifically focusing on the integration of agricultural production and biodiversity conservation as integral part of sustainable farming practices in Australia's temperate woodland regions.

- Dr Ross Hynes (Department of Environment and Conservation, NSW) researched the distribution of the endangered Southern bell frog (*Litoria raniformis*). The absence of *L. raniformis* populations in rice bays on northern farms of the Coleambally Irrigation area was found to be associated with higher exposure to the corn herbicide metolachlor and a lower pH, which should be considered indirect indicators of habitat type and farm practices. Low salinity, characteristic of rice-only farms, together with high water temperatures are additional factors determining the habitat preference of *L. raniformis*. Suppressed sexual development was a possible explanation for the difference between northern and southern populations.
- Ms Jacqui Salter's PhD research (Monash University) is on the modification of natural flooding and drying cycles that pose severe threats to wetland plant biodiversity. Chronic flooding favours submerged wetland plant species whilst seasonal fluctuations generally allow the greatest diversity of plant types to persist. In addition changing salinity may impair a plant's ability to tolerate changes to water regime. Swamp Paperbark (*Melaleuca ericifolia*) and the submerged wetland macrophyte, Ribbonweed (*Vallisneria australis*) will be used to understand the water regimes that would preserve a diverse community of aquatic plants.
- A project led by Prof. Barry Hart (Monash University) developed and tested Bayesian decision network models that will assist decision makers in making environmental flow allocations for Australian rivers and wetlands. The likelihood of sustaining multiple species was predicted for two river systems: the flow-stressed Latrobe River (Victoria) where the aim was to identify the key hydrological events required to maintain larval production of Australian Grayling and River Blackfish; and the Daly River (Northern Territory) where the aim was to relate environmental flows to two ecological (fish) endpoints —abundance of Barramundi and Sooty Grunter.
- Dr Leo Joseph (CSIRO) was researching new ways of understanding environmental controls on movements of birds across Australia and how climate change might impact those controls. The project was to produce an isoscape for the Australian continent (literally a map of the stable isotopes of oxygen, nitrogen, hydrogen and carbon in water and animals). It was to then use predictive modelling of one species (White-browed Woodswallow, *Artamus superciliosus*) to see if the isoscape can be used to identify where a specific specimen comes from and to track its life story. That information could inform management, particularly under conservation and climate change mitigation. Because of the cessation of LWA, the project was terminated 15 months short of its scheduled three-year timetable.
- Mr Andy Donnelly (Earthwatch) is developing *ClimateWatch* for engaging citizens in the observation and sharing of ecological information through well-designed information aggregation systems. This project will create a national dispersed-observer network to monitor national trends and patterns in species behaviour and phenology. Building on international experience in participatory processes that have successfully generated major scientific understanding and the successes of the *Australian Bird Atlas*, *Waterwatch* and Bureau of Meteorology this project will establish the collection of useful real-time phenological data from right across Australia. Two

years' work has been undertaken on this three-year project. At the end of the 2008–09 year, LWA was seeking to identify another agency willing to take on management of the project.

- Ms Sarah Rich's PhD project (University of Western Australia) aims to understand the responses of plant roots to flooding. Using the species *Cotula coronopifolia*, *Haloragis brownii* and *Mentha aquatica* as experimental plants the researcher is developing an understanding of the development, anatomy and physiological function of aquatic adventitious roots. Little is known about these key components of aquatic ecosystems. The experimental design has been developed and trials have been conducted.
- Ms Alison Skinner's PhD project (Charles Sturt University) will add to a wider-ranging assessment of ecosystem services and disservices associated with grassland states, and provide inputs into landscape dynamic models that can use patch-scale data to simulate future landscape function under various land-use scenarios. It will identify how typical grassland states influence tree regeneration processes.
- Ms Kimberley Nihill's PhD project at The University of Western Australia aims to survey and model reptile populations in forest restoration sites of different ages to answer the habitat restoration question "If you build it, will they come?" Alcoa mines bauxite in forest and has been continuously improving its mine site restoration practices since 1963. Using a chronosequence of unmined, 7, 11, 15 and 20–year-old restoration habitats to examine use, recolonisation dynamics and successional patterns of reptiles and in equivalent unmined forest areas will provide evidence for models to better predict outcomes of restoration investments.
- Ms Alison Howes's PhD research (University of Queensland) in the Brigalow Belt is in a national biodiversity hotspot where better understanding of how to optimise management of its extensive forests for biodiversity is needed. Inappropriate fire regimes and grazing by feral animals have altered habitat quality for groups of birds under threat such as granivores and ground-foragers. This project will determine the interactions among fire, grazing and habitat structure, and their influence on noisy miner presence and woodland bird assemblages, in order to develop sound land management principles that apply across the vast Brigalow Belt.
- Ms Megan Batterham's PhD project (University of Southern Queensland) is considering the systems in the upper Murray-Darling and the potential effects of climate change on sustainable management of agricultural landscapes. The project specifically aims to understand the role of box woodland and related floodplain systems in agricultural landscapes with respect to biodiversity, resilience and ecosystem function; determine how spatial patterns in the composition, resilience and condition of vegetation components of box woodland and related floodplain systems vary in relation to pastoral/agricultural land management; and model potential impacts of climate change.

Farming and food production

- Dr Ross Kingwell (University of Western Australia and Department of Agriculture) is developing a new business model that outsources sheep management on farms that specialise in cropping. Dryland farmers are labour short and time pressured and some concentrate on crop

production rather than animal production. As a result many farmers opt not to invest in establishing larger tracts of perennials, fodder shrubs and saltland pastures while continuing to run low stocking rate, low productivity, lower profit sheep systems. The model was quickly applied by a start-up company.

- Dr Richard Stirzaker's Land & Water Australia's Senior Research Fellowship allowed him to write a book titled *The Scientist's Garden* to be published by CSIRO. The powerful idea at its heart is Dr Stirzaker's quest to bring his professional life challenge—finding better ways to feed the world—down to the personal scale of his home garden. The book will be an accessible and inspiring contribution that will promote awareness of important issues in agriculture.
- Dr Mark Stafford Smith's Land & Water Australia's Senior Research Fellowship allowed him to write a book titled *Dry Times: Blueprint for a Red Land* to be published by CSIRO. The thinking in the book follows nearly three decades of life and experiences in desert Australia and climate change. He is convinced that rapid change is almost certainly going to come faster than the carefully-couched public estimates. This creates great uncertainties and, because deserts are all about dealing with uncertainties, they provide vital lessons of immediate relevance to a world beset by climatic, economic and resource variability.
- Ms Catherine Wagg's PhD project (RMIT University) is a 20–year retrospective on the *Potter Farmland Project*, a famous demonstration farm project in western Victoria. This case study makes new contributions to understanding adoption practices for sustainability at a farm scale. It informs the ongoing translation of R&D knowledge into farming practice. Contribution to the knowledge of farm-scale decision-making processes that might lead to sustainable and productive primary industries will be an important outcome of this research.
- Dr Greg Hertzler's (University of Sydney) research project developed a dynamic model to value ecosystem services and natural resources. It found land and water resource managers, who often value the ecosystem using their preferences and knowledge, are crucial particularly if they consult widely using citizen juries. Non-market valuations on the other-hand must eliminate their preferences to consume from the estimation of values and include the value of conserving emphasis on the citizens' role as owners rather than consumers. This challenges using non-market valuation, contingent valuation and choice modelling surveys (static consumer theory) and provides theoretical support for citizen juries.

Social research

- Ms Catherine Gross's PhD research (ANU) aims to find out how people interpret and react to fairness, or the lack of fairness, in critical areas of land and water resource management. The research is investigating real-life social conflicts in order to gain an understanding of participants' perceptions of justice and fairness in decision-making processes and outcomes. The case studies include water allocation decision-making in south-eastern Australia in which injustice could not be dismissed as purely self-interest.
- Ms Carina Wyborn's PhD project (ANU) will advance understanding of the factors that facilitate social and ecological

connectivity at landscape scale. It will help understand the importance of an individual's attachment to place as a motivator for conservation values. Existing cross-tenure management initiatives to achieve congruence of landscape-scale policy settings, institutional frameworks and motivations will be explored along with the suitability of current policy interventions (eg Market-based instruments, regional plans, etc.). The aim is to provide critical insights into the institutional arrangements and motivations required to facilitate landscape-scale management.

Soil management

- Dr Warren Bond's research (CSIRO) developed a new soil water sensor that measures soil capacitance in Australia's heavy clay subsoils. The sensor overcomes the difficulty of reliably installing pronged instruments, while maintaining the necessary precise measurements. It also avoids confounding problems of saline water that affects commercially available capacitance-based sensors although the temperature dependence challenge will remain. The research involved the use of a new buried data transmitter for convenient use on farms.
- Dr Pauline Mele (Department of Primary Industries Victoria) used her Land & Water Australia Senior Research Fellowship to bring together the evidence for research investment failure in the field of soil biology. Productivity and sustainability outcomes that follow from investment in research, improved understanding and managing soil biology have been investigated internationally and in Australia. The project developed a synthesis of what investments have been made and made recommendations for future investment. The project engaged the Grains Research & Development Corporation (GRDC) and other associated researchers directly.
- Dr Chris Hardy (CSIRO) developed a microarray chip (Affymetrix) to encapsulate a broad range of biota and functional genes diagnostic of key major biogeochemical process within sediments. DNA extracted from sediments in impacted and reference locations (in the first trial Sydney Harbour sediments were used) can be compared to the microarray, providing information which can be used to identify differences in biota and the expression of functional genes between locations. Using Life Systems 454 gene sequence technology provides lower cost and faster data than existing methods, quickly focusing attention on the significant issues in the ecosystem.

Energy analysis

- Mr Barney Foran's research on the *Transition to a biofuel economy in Australia* represents the first systematic investigation of what is needed if Australians are to continue living anything like their current lifestyles using sustainable biofuels and reveals options that are radical and optimistic. He used the evidence available and conservative assumptions in the *OzECCO* model to discover options that accommodate greenhouse emission reductions, livelihoods and land, water and energy implications. The research started over eight years ago within CSIRO and has become increasingly important with the realisation of climate change and the energy crisis.
- Dr Jago Dodson's (Griffith University) research on rural and regional Australia

is finding out more exactly how vulnerable they are to increased transport fuel costs. The past three years have seen a trend towards higher global petroleum prices with a resulting increase in domestic fuel prices. Rising fuel prices and the possibility of supply shortages would have significant implications for the rural and regional sector given the extent of use of these inputs in farm production. Yet there is very little known about the likely secondary impact of such price increases or supply constraints on the farming sector and on rural and regional areas generally. Two years work has been undertaken on this three-and-a-half-year project. At the end of the 2008–09 year, LWA was seeking to identify another agency willing to take on management of the project.

Events and activities

- *Drought in a changing climate, sharing management approach,*
  17–19 November 2008
  facilitated international meeting to investigate management approaches for drought and water resources in a changing climate in the USA and Australia for 40 people.

- *Meetings with the Department of Prime Minister and Cabinet, the Murray-Darling Basin Commission, Department of the Environment, Water, Heritage and the Arts (DEWHA) and Department of Agriculture, Fisheries and Forestry (DAFF)*, 22 July and 31 July 2008
  facilitated meetings about the impact of broadscale land clearing on climate and about resilience in wheatbelt farming (15 people in each).

- *International meeting to discuss endocrine disrupting chemicals*, 8 August 2008
  facilitated meeting at University of Technology, Sydney for 46 people.

- *Veg Futures conference*,
  21–23 October 2008
  led two sessions - *What future do MBIs have in farming landscapes?* and *Peri-urban and Peri-rural futures* (50 people in each).

- *Caring for our Country Monitoring, Evaluation Reporting and Improvement Strategy*, 25–26 November 2008
  participated in development.

- *Ecosystem services and NRM practice: Where the rubber hits the road*,
  13 March 2009
  facilitated workshop for 15 people.

- *Dr Larry Barber presentations* on endocrine disrupting chemicals
  facilitated briefings in Melbourne, Adelaide, Brisbane, Sydney and Canberra for water researchers, utilities and regulators (250 people).

- *Minimising off-site movement of pesticides and impact on the Great Barrier Reef,*
  18–19 May 2009
  facilitated workshop for 60 people.

Key Performance Indicators	2008–09 Targets	Achievement against targets
All listed projects completed	Final reports submitted and approved	19 Final reports submitted and approved for publication including 11 Innovation projects, 4 Land & Water Australia Senior Research Fellows, 2 PhDs and 2 Land & Water Australia International Fellowships (see below).
Capacity to invest in innovative research to solve natural resource management increased	Increased confidence in the development of innovation problem statements and selection of postgraduates and research fellows	Innovation Research Investment planning completed. 5 top topics needing research have been sent to Chief Scientist of Australia (Prof. Penny Sackett)
Selection of the best researchers and projects through the Innovation Projects Call, Postgraduate Call and Senior Research Fellows Process	Up to five new Innovation projects, four postgraduates and two Senior Research Fellows selected and resourced	4 new Innovation projects, 4 PhD and 2 Senior Research Fellows selected and contracted.
Innovation knowledge into practice	Workshops, meetings and publications to support innovation project knowledge into practice Return on investment analysed on some completed projects	12 workshops and many publications provided support for knowledge into practice. Many other publications and meetings happen within and after the projects. Return-on-investment analysis undertaken for Dr Rick Evans' groundwater-surface-water Senior Research Fellowship and Indigenous projects.

People Arena

Social and Institutional Research Program (SIRP)

The Program invested in research, knowledge and adoption activities and communication on the social and institutional dimensions of land and water issues. Our portfolio of work focused on long-term sustainability of landscapes, lifestyles and livelihoods in rural Australia by understanding, supporting and informing people working in land and water management including policy development. Further information can be found at lwa.gov.au.

With the cessation of Land & Water Australia, most SIRP projects were able to be completed during the wind-up period. At the end of the 2008–09 year LWA was negotiating to transfer the management of two incomplete projects to other agencies. The fate of all projects is listed in Appendix 1.

Executive Managers

Mr Bruce Wright/Mr Jim Donaldson

Partners

The Program undertook participatory action research in collaboration with a wide range of partners including catchment management authorities (or similar regional bodies), local government, state government agencies, industry groups and national research and policy bodies (eg universities, CSIRO, DAFF and DEWHA).

It established a key partnership with the National Water Commission to undertake participatory action research in water planning at state and regional levels. The project, *Water Planning Processes: Lessons, Gaps and Adoption* was implemented in 2008–09. It included a key R&D activity, *Water Planning Tools*, which worked with three trial regions (Central Condamine River and Tributary Alluvium, the River Murray Prescribed Watercourse, and the Tiwi Islands) to develop tools to assist communities and governments as they address challenges in water planning. It extended knowledge and skills into the water planning sector and informed policy-making at national and state levels. This is one of the projects whose management LWA was negotiating to transfer to another agency.

The Program also had a funding partnership with the Australian Government Land and Coasts group of the Department of the Environment, Water, Heritage and the Arts and the Department of Agriculture, Fisheries and Forestry, and invested in research on the social assets in Australian natural resources and a project to map the spatial footprint of key agricultural industries.

Program duration

The Program commenced in 1998–99 and was an ongoing investment of Land & Water Australia under the *Strategic R&D Plan 2005–2010.*

Expected program outcomes

- Social and institutional knowledge for primary industries' adaptation strategies and managing the socio-economic impacts of climate change and water availability.
- The advancement of knowledge and practice that facilitates and improves the participation of Indigenous Australians in land and water natural resource management.
- The advancement of knowledge and provision of options for the creation of markets and best regulatory practice for environmental good and services.

- Building the capacity of regions in planning, managing, monitoring and evaluating natural resource use and conservation and adapting governance, investment and practice.

Total expenditure budget for the program

$6.0 million was planned under the current *2005–2010 Strategic R&D Plan*.

Expenditure for 2008–09

$1.545 million (LWA $0.831 million)

Program highlights

Priorities that drove the program during the year and achievements against these priorities included the following:

Social and institutional knowledge for primary industries adaptation strategies and managing the socio-economic impacts of climate change and water availability

Research undertaken during the year produced fit-for-purpose guidelines and tools for improved water planning in the context of climate change at the catchment and regional scale in Australia. The program also produced methodologies and practices for assessing socio-economic impacts in land and water planning processes. These have been documented and are being validated in water planning processes in a number of jurisdictions (South Australia, Northern Territory and Queensland). They were also presented at a national forum of water planners on the Gold Coast and made available on the water tools website waterplanning.org.au.

The advancement of knowledge and practice that facilitates and improves the participation of Indigenous Australians in land and water management

During the year, the Program produced guidelines, processes, protocols and policy options for Indigenous knowledge (traditional and scientific) being incorporated in Australian natural resource management and providing for greater and more effective Indigenous participation in land and water planning and management. SIRP research with Indigenous people and communities was highly valued and respected by them and has contributed to developing their capacity for participation and engagement in relevant programs and policies.

Building the capacity of regions in planning, managing, monitoring and evaluating natural resource use and conservation and adapting governance, investment and practice

Participatory action research undertaken during the year produced best-practice governance guidelines in land and water management at the regional level, and tools for improved investment decision making in land and water and environmental practice change leading to improved outcomes. These guidelines and tools have been accepted by regional practitioners as being influential in their planning and operations.

Specific activities that will provide a legacy for social and institutional research and influence future directions of other agencies included synthesis reports of LWA-funded research relating to:

- development of markets for environmental goods and services and instruments for market activities for buyers and sellers
- productive, adaptive and sustainable land use for agriculture
- institutions, policy and governance for land and water management at the regional level
- Indigenous knowledge of, and participation in, land and water management.

New knowledge

- Best practice governance in land and water management at the regional level
- Tools for improved investment decision making in land and water and environmental practice change leading to improved outcomes
- Tools for improved water planning in Australia
- Processes, guidelines, protocols and policy options for Indigenous knowledge (traditional and scientific) being incorporated in Australian natural resource management and providing for greater and more-effective Indigenous participation in land and water planning and management.

Events and activities

- *Science in the Paddock*, July 2008, Canberra
  event management and organisation; speaking engagements from LWA researchers; 150 delegates; significant distribution of two major publications: *Healthy Country, Healthy People* and *Incorporation of Indigenous Cultural Values in Water Planning: The Anmatyerr Story.*
- *Designer Carrots Conference*, September 2008, Brisbane
  speaking engagement; 200 delegates; speaker presentation and paper promoted on *Designer Carrots* website.
- *World Indigenous People's Conference on Education*, December 2008, Melbourne
  sponsorship of $5,000; exhibition stand; 1,000 delegates (including significant international representation); significant publication distribution of Indigenous NRM research.
- *Australian Agriculture and Resource Economics Society* (AARES), February 2009, Cairns
  Platinum Sponsorship negotiated by SIRP – included chairing of Opening Keynote and Conference dinner welcome address; 400 delegates; significant distribution of Market-based instruments (MBI) publications.

- *Australian Bureau of Agricultural and Resource Economics (ABARE) Outlook Conference*, March 2009, Canberra
  presented *Farming in the dry* session (200 attendees, full house with standing room only); chaired session; sponsored session; exhibition stand; management of joint Rural RDC stand; multiple speaking engagements; 750 delegates; distribution of significant number of key publications including *Managing Climate Variability*; climate change and presentation papers.

- *Australian Network for Plant Conservation*, May 2009, Halls Gap
  major sponsor; key speaking engagements; 100 delegates; distribution of LWA publications including *Thinking Bush*, MBIs etc.

- *Native Title Conference*, June 2009, Melbourne
  sponsorship, chairing and speaking engagements; 700 delegates; distribution of SIRP publications on Indigenous NRM.

- *National Farmers Federation National Congress*, June 2009, Brisbane.
  distribution of relevant research reports and other publications from trade stand

Land & Water Australia at ABARE conference, March 2008.
Left to Right: Ms Claire Harris, Dr Michael Robinson, Ms Nerida Hart.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Engagement of key audiences, leading to use by government and natural resource managers of SIRP research findings in recognising social and institutional implications of policy developments and natural resource management, including in Indigenous culture and the land, and in water planning	◗ An increase in the influence of social and institutional research on project planning and policy making ◗ Improved capacity of participating natural resource management regional bodies to plan, manage, review and adapt their investments in practice change to lead to improvements in condition of natural resources ◗ Identification of gaps in implementing water planning processes in relation to the requirements of the National Water Initiative ◗ Identification, assessment and characterisation of the social assets in the natural resource management system	◗ High level recognition of policy makers of social and institutional research as evidenced by the SIRP *Monitoring and Evaluation Project*. ◗ Provision of a wide-range of planning and management tools for NRM practitioners at the regional level that have been accepted by the practitioners as being influential in their planning and operations. ◗ Documentation of water planning tools that have been validated in water planning processes in a number of jurisdictions. ◗ Provision of methodologies and practices for assessing socio-economic impacts in land and water planning processes.

Sustainable Industries Arena

Climate Change Research Strategy for Primary Industries Program (CCRSPI)

including Primary Industry Adaptation Research Network (PI ARN)

The *Climate Change Research Strategy for Primary Industries Program* (CCRSPI) is a national collaborative partnership established to coordinate and communicate climate change research (covering both mitigation and adaptation).

The *Primary Industry Adaptation Research Network* (PI ARN) is one of eight national networks established to deliver climate change adaptation research coordination.

Further information can be found at lwa.gov.au.

Executive Manager

Ms Anwen Lovett

CCRSPI Partners

- Australian Egg Corporation Limited
- Australian Pork Limited
- Australian Wood Innovation Limited
- Cotton Research & Development Corporation
- Dairy Australia
- Fisheries Research & Development Corporation
- Forest and Wood Products Australia
- Grains Research & Development Corporation
- Grape & Wine Research & Development Corporation
- Horticulture Australia Limited
- Meat & Livestock Australia Limited
- Rural Industries Research & Development Corporation
- Sugar Research & Development Corporation
- Department of Agriculture, Fisheries and Forestry
- Department of Agriculture and Food, Western Australia
- Department of Primary Industries, New South Wales
- Department of Primary Industries, Parks Water & Environment, Tasmania
- Department of Primary Industries and Fisheries, Queensland
- Department of Regional Development, Primary Industry, Fisheries and Resources, Northern Territory
- Primary Industries and Resources, South Australia
- CSIRO

PI ARN Partners

- University of Melbourne
- Queensland University of Technology
- Department of Primary Industries Victoria
- University of Western Australia
- CSIRO Climate Adaptation Flagship

Program duration

2007–08 to 2012–13

Expected program outcomes

CCRSPI

- Coordination of primary industries climate change research on a national level.
- Collaboration to avoid duplication of planned research among partners, delivering research investment efficiencies.
- Communication of key climate related initiatives among CCRSPI partners, and of key climate research related initiatives to external organisations on behalf of the partners.
- Organisation and delivery of climate change research priority workshops with individual Research and Development Corporations.

PI ARN

- Coordination and communication of climate change adaptation research activities in order to deliver better national research outcomes and develop capacity within the primary industry sector.

Total expenditure budget for the program

CCRSPI: $2.010 million including funding from partners of $1.100 million in 2008–09.

PI ARN: $1.340 million through to 2012.

Expenditure for 2008–09

CCRSPI: $0.618 million (All partner funding)

PI ARN: $0.070 million (All partner funding)

Note—the Land & Water Australia contribution to CCRSPI for 2008–09 was allocated to PI ARN under the proposal to host PI ARN. The CCRSPI Steering Committee supported development of this proposal.

Program highlights

Key highlights from the program during 2008–09 include:

CCRSPI:

- National coordination of proposals to the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) call for Expressions of Interest (EOIs) under Australia's *Farming Future Climate Change Research Program* Phase 1.
- Sponsorship of *Greenhouse 2009* and sole sponsorship of Australian Farm Institute conference on the Emissions Trading Scheme (ETS) and agriculture.
- Collaborative delivery of seven climate change research coordination workshops with CCRSPI partners.
- Delivery of five climate change Fact Sheets (An introduction to CCRSPI—*Australia's primary industries working together on climate change*; *Life Cycle Analysis* with the Rural Industries Research and Development Corporation (RIRDC); and three publications addressing the needs of the egg, horticulture and pork industries).
- Review of technical specifications of the *Australian Agriculture Natural Resources Online* (AANRO) database, recommendation to include Indigenous

thesaurus, spatial reporting, and entry fields for "$", securing $0.015 million (excl GST) of funding from DAFF to support development and delivery of AANRO, population of AANRO database with information on climate change projects from CCRSPI partners.

- Securing in-principle agreement from CCRSPI partners to continue the CCRSPI program for another five years, through to the end of 2013.

Future: On 5 March 2009, CCRSPI partners made an in-principle commitment to continue the program for an additional five years with funding of $0.950 million per year. At its 14 May 2009 meeting, the CCRSPI Steering Committee agreed that CCRSPI would seek a new host institution among the existing partners. The CCRSPI Secretariat ran an Expression of Interest (EOI) process to this end. The new host for CCRSPI will be determined by a special committee set up jointly by the Council of Chairs of Rural Research Development Corporations and the Primary Industry Standing Committee R&D Sub-Committee.

PI ARN:

- Re-drafting of PI ARN proposal resulting in Land & Water Australia being accepted as the host institution, with approval from the National Climate Change Adaptation Research Facility (NCCARF), the Department of Climate Change (DCC) and the Minister for Climate Change.
- Approval of 2008–09 and 2009–10 budgets and operational plans.
- Completion of process to select research node leaders for PI ARN.
- Identification of leading academics to be research 'node' leaders, responsible for coordinating activity at a national level around priority research areas.
- Alignment of PI ARN with CCRSPI to ensure best possible outcome for primary industry research.

Future: In light of the decision to close Land & Water Australia, DCC and NCCARF have decided to retender PI ARN. A full public tender process is being used to choose a new host institution, with this process managed by NCCARF.

New knowledge

- *Australian Agriculture Natural Resources Online* (AANRO) database now at prototype stage—development of spatial reporting using CCRSPI funding completed.
- CCRSPI partners providing information on climate change projects for inclusion in AANRO.

Events and activities

- *Greenhouse 2009*, 23–26 March 2009

  CCRSPI sponsorship and chairing session on climate communication.
- *Agriculture and the Emissions Trading Scheme* conference, 6–7 May, 2009

  proceedings from the CCRSPI-sponsored Australian Farm Institute (AFI) conference.
- *Fact sheets*

  sponsored and delivered jointly with Horticulture Australia Limited, Australian Pork Limited and the Rural Industy Research Development Corporation (penultimate drafts).
- *CCRSPI workshops*, including outcome reports
  1. RIRDC—Life cycle analysis workshop
  2. Australian Egg Corporation Limited (AECL)—climate change coordination workshop
  3. AFI conference on the *Emissions Trading Scheme (ETS) and agriculture*, Maroochydore, 6–7 May 2009
  4. *Climate variability workshop*, 4–5 June 2009, Canberra
  5. Sugar RDC (SRDC), climate coordination workshop, 19 June 2009
  6. Cotton RDC (CRDC)—climate coordination workshop, July 2008.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Finalise CCRSPI Phase 1	Finalise and disseminate CCRSPI Phase 1 outputs	Completed
Identification of research priorities and development of research investment plans	Development and delivery of national, regional and commodity-level research investment plans Development and delivery of a nationally co-ordinated and collaborative investment framework for long-term research and knowledge management	Re-scoped. This KPI was rescoped as a result of the release of the Australian Government DAFF Climate Change Research program call for Expressions of Interest. The CCRSPI program supported collaboration in development of proposals by partner organisations, and members of the CCRSPI Steering Committee were on the DAFF panel that advised on allocation of research funds. Information continued to be exchanged between CCRSPI partners on their research priorities, and areas for priority investment were identified.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Identification of governance requirements for ongoing co-ordinated and collaborative research program	Development of and agreement on a draft governance structure and ongoing operation plan, including opportunities for funding and co-investment	Completed. Governance framework, operational work program and budget all established for 2008–09. All capital collected from partners, and 2008–09 work program substantially completed as agreed in Deeds with Funding Partners. In-principle agreement reached, on 5 March 2009, for CCRSPI investors to continue supporting the program for another five years. Proposal for PI ARN, emphasising alignment with CCRSPI, was approved by NCCARF, DCC and Minister for Climate Change.
Greater understanding by policy, research and industry of the implications and alternatives of Emissions Trading on primary industries	Investments in emissions-trading-related research (economic analysis, soil carbon, mitigation potential) and adoption of outputs.	Completed—delivery of national conference (May 2009) on the ETS, sponsored fully by CCRSPI, and support for *Greenhouse 2009* conference. CCRSPI also worked with RDCs to design and fund topic and commodity specific workshops considering how primary industries can respond to the current climate change regulatory framework, and the research priorities to support this response.

Managing Climate Variability Program (MCV)

The *Managing Climate Variability Program* has been helping Australian farmers to manage climate risk for over a decade, providing them with practical tools to incorporate climate information into farm business decisions. The program's top priorities are to:

- improve seasonal forecasting - its accuracy, lead time and ease of use
- provide tools and services for managing climate risk
- increase adoption of climate risk management among Australian farmers and natural resource managers.

The program is a long-standing collaboration between six of the rural Research and Development Corporations and, up until 2007–08, the Australian Government Department of Agriculture, Fisheries and Forestry.

The Program has a *Research and development strategy, 2008–2014* which sets out the priority areas for research, development and extension. The *Strategy* focuses on investments which will increase forecasting accuracy, build the predictive capability of key attributes to agriculture such as soil moisture, and develop tools which translate climate forecasts and resource attributes into decision-support tools for primary producers and natural resource managers.

The *Managing Climate Variability Program* partners strongly supported the continuation of the program after the cessation of Land & Water Australia. In order to facilitate this, the Grains Research & Development Corporation agreed to take over Managing Agent responsibilities for the program commencing 2009–10.

Further information can be found at managingclimate.gov.au.

Executive Manager

Ms Anwen Lovett

Partners

- Australian Government Department of Agriculture, Fisheries and Forestry
- Grains Research & Development Corporation
- Meat & Livestock Australia Limited
- Dairy Australia
- Rural Industries Research & Development Corporation
- Sugar Research and Development Corporation

Program duration

2007–08 to 2009–10

Expected program outcomes

- Improved climate risk management across agricultural industries and natural resources management based on a foundation of improved skill in seasonal forecasting.
- Identification and increased adoption of improved practices that will improve primary industry resilience to our increasingly variable climate—the key manifestation of climate change.
- More reliable and longer range seasonal forecasting, particularly in northern Australia, south-eastern Australia and south-west WA and SA, and with a focus on regionally-relevant forecasts with timeframes relevant to agriculture.
- Improved prediction of water catchment yields to improve management of urban water resources, irrigated agriculture, fisheries and environmental flows.

- Wider availability of commodity-specific decision-support tools to improve grower use of climate risk management strategies.
- Improved knowledge and adoption networks to assist growers to better understand the implications and adaptation strategies associated with climate variability and change, and foster uptake of climate related opportunities.

Total expenditure budget for the program

$5.570 million (Phase 2)

Expenditure for 2008–09

$1.633 million (LWA $0.500 million)

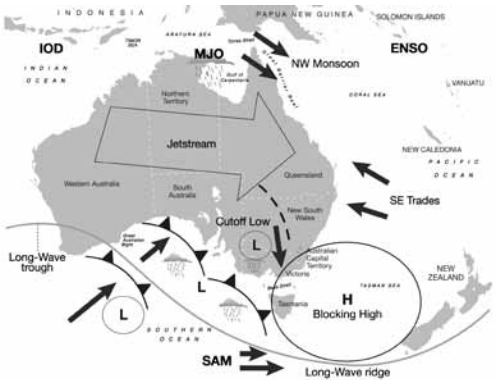
Program highlights

Key highlights from the program during 2008–09 included:

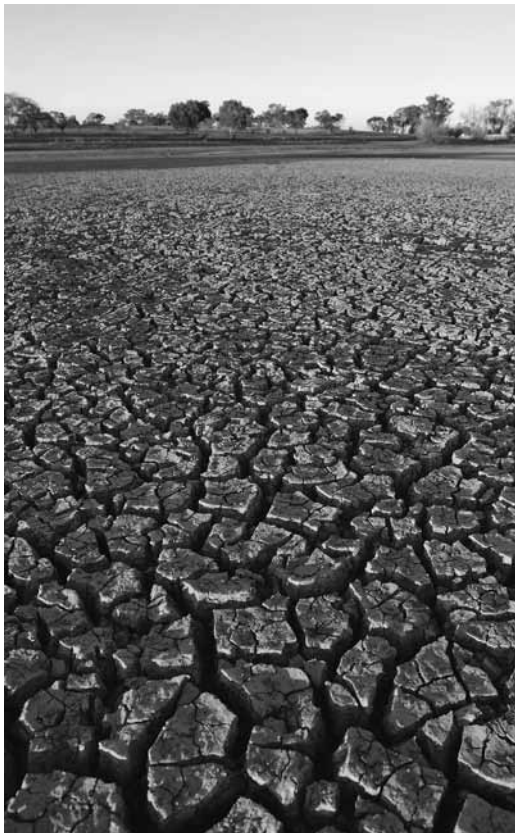
- 660 farmers participated in Masters of Climate or Farmer Forums which were hosted by MCV
- farmer knowledge (information) needs via the web on climate better understood and used to inform design of the Bureau of Meteorology (BOM) *Water and the Land* (WATL) and *Climate Kelpie* websites
- MCV co-sponsored the WATL website, with in excess of 70,000 users visiting the site in February 2009
- Northern, Eastern and Climate Forecasting Investment Plans were completed with negotiations well underway for new research to be contracted and new investors identified to support the work
- $3 million in new research with BOM was successfully negotiated (to be delivered by the new Managing Agent)
- in-principle commitment from MCV partners for an extension of the program to 2014
- submissions and representations made to numerous federal inquiries into climate change, variability and seasonal forecasting.

Fostering farmer relevant climate and forecast information

About 15 per cent of all investment by *Managing Climate Variability* is in knowledge, adoption and communication. Since the droughts of the mid 1990s, many research projects have explored adoption rates and hypothesised as to why there have been only slow improvements in adopting a climate risk management response to agriculture. As Dr Zvi Hockman noted in a recent *Managing Climate Variability* report: "decision–support systems (DSS) can help farmers adjust their management to suit seasonal conditions...[but] farmers do not adopt the vast majority of such systems, a problem identified as the 'implementation problem'."



With this in mind, *Managing Climate Variability* worked in partnership with Econnect, the Bureau of Meteorology, and users of climate information across Australia to produce an ongoing series of farmer-priority climate forecast products. These are available on the Bureau's *Water and the Land* [WATL] website and are routinely maintained. The outcome in terms of climate risk management adoption is possibly best measured by use of these products. The WATL site is now receiving over 70,000 hits per month. The estimated number of Australian farming enterprises operating in 2009 is less than 140,000, so while some hits may be repeat visits or visits by non-farmers, clearly the approach taken by *Managing Climate Variability* is meeting the information needs of many in Australian agriculture.



Placing climate change in an agricultural context

Managing Climate Variability was requested to lead a partnership to compile and deliver climate change information to the southern Australian wheat-sheep belt. MCV readily accepted the challenge to work with the Bureau of Meteorology, Meat and Livestock Australia, the Bureau of Rural Sciences and the Birchip Cropping Group.

The immediate outputs were:

- more than twenty fact sheets explaining climate variability and the implications for sheep and wheat production from productivity and economic perspectives
- three two-day Climate Champion forums that trained about twenty key farmers, agribusiness representatives and extension staff in three regions
- design of *Farmer Forums* and the fostering of farmer attendance by these groups of Climate Champions
- more than 600 farmers attending the one-day forums in the three regions
- translation of all the information onto the *Climate Kelpie* website (which will be available in the latter half of 2009).

Two key issues were strongly reinforced and agreed to at all the farmer forums:

- climate change is a sufficient rationale for Australian agriculture to participate in a mitigation agenda
- adaptation to a changing climate is best achieved through ongoing and continuous improvements to agricultural practice, and to foster this adaptation more reliable multi-week and seasonal forecasts are essential.

This initiative clearly demonstrated the role of Climate Champions within the agricultural sector and the need for ongoing resources to keep these Champions up to date with science findings. *Managing Climate Variability* intends to further resource Climate Champions activities and build a larger network of Champions across Australia as resources permit.

New knowledge

In addition to the substantial output of peer-reviewed papers, MCV completed a *Science Plan for Climate Forecasting* and was in the process of contracting the four top priority projects which had been identified under that *Plan* during June 2009. It is envisaged that a new MCV Managing Agent will take on these contracts and deliver this important work.

Improving Australia's climate forecasts

Managing Climate Variability through its R&D investment seeks to ensure more certainty in climate forecasts for multi-week, monthly to seasonal, annual and inter-annual timescales.

Australia needs to improve climate forecast skill if we are to meet the challenge of Australia's changing and even more variable climate. POAMA, Australia's dynamic climate model has been progressively improved in skill through a long term partnership between the Bureau of Meteorology and *Managing Climate Variability* [and previously the *Climate Variability and Agriculture Program*]. This work will continue well into the future in parallel with and linked to the other six to eight world-leading dynamic models.

Key knowledge outcomes over Phase 1 and the first two years of Phase 2 of *Managing Climate Variability* [2004–05 to 2008–09] included:

- markedly improved skill in predicting the extent, duration and breaks in the tropical Australia monsoon, including defining a series of climate forecasting products that can be routinely provided as an aid to northern Australian agriculture, fisheries and natural resource managers
- quantification at a regional scale of the changes in climate variability for key climate attributes such as frost, temperature and rainfall that can be defined from the Australian Climate Record, and thus also provide an indication of the nature and extent of likely further changes in climate variability for any particular region and its agricultural industries as Australia's climate changes
- characterisation of rainfall-bearing synoptic systems for south-eastern Australia, linked to the longer space-scale and time-scale atmospheric conditions and ocean circulation, especially as the theoretical basis for predicting the likelihood of both blocking high pressures and rain-bearing cut-off lows, essential if our skill in forecasting dry and wet seasons for the SA, southern NSW and Victorain wheatbelts is to be improved.
- quantification of the shifts in south-eastern Australian climate, especially in terms of the seasonal changes in rainfall patterns, which has been found to broadly correlate with the shifts in seasonal rainfall patterns being experienced in Western Australia
- quantification of the role and influence of the key climate drivers on Australia's climate (eg Southern Annual Mode, Indian Ocean Dipole, Madden Julian Oscillation) with preliminary understanding of the

interaction between these drivers that manifests through various synoptic features such as trade winds, cyclones and depressions, inland troughs, blocking high pressures, cut-off lows, cloud bands and frontal changes.

Research is in progress to:

- deliver routine multi-week forecasting from POAMA, Australia's dynamic climate model, assisting many tactical decisions on farm and benefiting other climate users such as Emergency Services
- improve ocean initialisation in the dynamical model, exploiting the increasingly improved remote sensing array in the Pacific, Indian and Southern Oceans, markedly improving POAMA's skill, especially for the regions of Australia not predominantly influenced by the Pacific Ocean
- better depict the teleconnections between Australia's climate drivers so the dynamic model more accurately predicts synoptic features
- evaluate, based on the past 27 years of climate record, the economic benefits of dynamic forecasting for the Western Australia wheat and sheep industries, providing a rigorous basis to demonstrate to farmers the role that seasonal forecasts can play in their decision making.

Soil, climate and water resources—predicting availability

Managing Climate Variability seeks to accurately predict key climate attributes pertaining to agriculture and natural resource management such as soil moisture, frost, catchment runoff and wet season duration.

The task is a substantial scientific challenge —translating our ever improving skill in climate forecasts into predicting the behaviour of key physical attributes, all within the context of a changing climate. Responses are not necessarily linear - as an example, for the Murray Basin it has been shown that a 10 per cent reduction in mean annual rainfall due to climate change may lead to a 20 to 30 per cent reduction in mean annual runoff. Understanding the inter-relationships is challenging and will require ongoing investment in parallel with investment in improving climate forecasting skill.

Key knowledge outcomes over the period of *Managing Climate Variability I* and the first two years of *Managing Climate Variability II* [2004–05 to 2008–09] included:

- more precision in predicting evaporative demand with a changing and more variable climate, including the recorded changes to temperature and wind patterns—the resulting improved data series and algorithms have been incorporated within SILO, the climate data management system accessed by many climate and agricultural researchers
- improved algorithms to predict productivity of various crops, especially cereals, as part of the enhancement of APSIM *(Agricultural Production Systems Simulator)*, Australia's leading production simulation model
- improved models to predict liveweight gain and wool yield as a flow-on set of producer orientated products from improvements in projections of pasture growth from climate forecasts
- better understanding of the relationships between rainfall, soil type, other climate attributes and runoff so that the runoff to rivers and storages in the Murray Basin is now more accurately predicted and can also be linked to climate forecasts.

Research is in progress to:

- Quantify the changing nature of extreme climate events, their impact on key agricultural industries and the strategies that these industries might then employ to reduce risk.
- Project the likely changes to extreme events with a changing climate in sugar growing catchments and then compare these extreme events with current A-level practices. This will determine the nature and type of further research required to improve cultivation, fertiliser and chemical practices so that the sugar industry can adapt its practices to minimise any downstream impacts, especially water quality entering the Great Barrier Reef.
- Collate key climate thresholds or tipping points for the production of a range horticultural crops. These thresholds will then be compared with the projected scenarios for climate change to inform horticultural practice shifts and research activities.

Agriculture applications

Managing Climate Variability seeks to provide increasingly accurate, and most importantly, useful decision-support tools that link climate variability to agricultural profitability and sustainability. Tools need to progressively incorporate the improving climate forecast skill and our improving knowledge of how physical attributes such as soil moisture vary under a more variable and changing climate.

Key knowledge outcomes over the period of *Managing Climate Variability I* and the first two years of *Managing Climate Variability II* [2004–05 to 2008–09] included:

- translation of seasonal forecasts into products and predictive tools for dairy farmer feedbase management
- improved econometric models to explore the financial risk reduction benefits of Farm Management Deposits
- *Yield Prophet*, a decision-support tool for cereal cropping, including various enhancements to cover a wide range of cereal types and varieties, soil types and cropping practices together with various extension activities and system upgrades to foster adoption
- assessment of the role of climate forecasting in improving revegetation outcomes and plantation establishment strategies
- models and field proofing of *AussieGRASS* and *PaddockGRASP* for the rangelands of western NSW, as a key decision-support input to both stocking rate strategies and landscape sustainability
- demonstration of the role of Derivatives and other insurance strategies as part of climate risk management in the Australian cereal industry
- analysis of climate variability and the implications for changes in on-farm practice and cropping strategies to maximise sustainability
- *Whopper Cropper*, a decision-support tool to incorporate forecasting information into regional-scale cereals cropping and productivity decisions.

Research is in progress to:

- explore changing frost and heat wave regimes with Australia's changing and more variable climate; This information will provide input to on-farm practice shifts and climate adaptation strategies in the cereals and grape industries

- better integrate and make available to users the various decision-support tools, including better quantification of each tools benefits and limitations.

Knowledge, adoption and communication

Managing Climate Variability seeks to foster increased understanding and uptake of climate-related opportunities that benefit agriculture and Australia's natural resource condition.

The translation of climate information into real-life action requires three essential components [Meinke *et al*. 2006]. These are:

- salience—the perceived relevance of the information
- credibility—the perceived technical quality of the information
- legitimacy—the perceived objectivity of the process by which the information is shared.

The challenge is to identify where improved forecasting knowledge and decision-support tools can provide the most benefit and make sure these opportunities are captured.

Key knowledge outcomes over the period of *Managing Climate Variability I* and the first two years of *Managing Climate Variability II* [2004–05 to 2008–09] included:

- projections for key climate attributes as Australia's climate changes as one of many inputs into Natural Resource Management Group preparation of their Natural Resources Regional Plans
- development of a series of climate forecasting products that match user needs and their routine delivery through the WATL component of the Bureau of Meteorology website; this includes locally specific historical climate data, current data and projections [rainfall, frost, wind, heatwave, evaporation, solar radiation—all as gridded datasets and with selected projections and forecast derived products to the specification of agricultural industries
- training of more than 60 Masters of Climate and then working with them to foster increased understanding of climate change and variability in over 600 farmers from the Victorian Wimmera, South Australia and the north east agricultural region of Western Australia
- regular publication of *CLIMAG*, at about three to four editions a year, with the newsletter extensively circulated among Australia's farming and natural resources sectors
- climate awareness activities in Queensland, Victoria, South Australia and Western Australia with a range of ongoing state agency products such as web-based updates and newsletters such as *The Break* and *The Fast Break*
- fostering awareness and adoption among pastoralists of the products and information available through *AussieGRASS* for the Northern Territory
- fostering awareness and use of climate risk management tools such as *PyCal* and *Yield Prophet* among key regions for the cereals industry.

Research is in progress to:

- provide additional user-orientated climate products, including multi-week forecasting outputs, seasonal predictions from POAMA and a seamless climate record and projections across Australia on the WATL component of the Bureau of Meteorology's website

- complete the first phase of the *Climate Kelpie* website, including detail of climate drivers and synoptic features for all states and a ready reference and links to key climate risk management tools
- continue publication of *CLIMAG*
- continue the expansion of the Climate Champions network.

Events and activities

- *CLIMAG*, November 2008, January 2009, June 2009
  8–page newsletter distributed to 2,000 stakeholders; also available on the MCV website.
- 38 communicating climate change fact sheets
  produced for the MCV website. Hard copies distributed at *ABARE* and *Greenhouse 2009*.
- CCRSPI-MCV climate variability workshop
  organised for government and researchers stakeholders, around 40 attendees.
- *MCV Managing Climate Variability R&D Strategy, 2008–2014*
  distributed by mail to 2,000 stakeholders, and at the *Greenhouse 2009* and *ABARE* conferences; also available on the MCV website.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Climate informed producers and communities with a network of Climate Masters in place.	More than 50 Masters of Climate within an active network across southern Australia.	a) More than 60 farmers and agribusiness consultants attended a two-day workshop on climate information and interaction—the basic training for people to become 'Masters of Climate' b) 'Masters of Climate' from each Workshop (Vic/SA/WA) assisted in designing farmer forums c) More than 600 farmers attended the one-day farmer forums, being an introduction to managing climate (variability and change) in their region d) More than 50 additional farmers expressed interest in becoming 'Masters of Climate', however a funding source could not be identified to continue this activity.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Rationalisation of climate relevant information sites, fostering ease of access and probably increased uptake of climate risk management	Increased use of the Bureau of Meteorology (BOM) and National Agricultural Monitoring System (NAMS) websites	a) Investment in developing farmer relevant products in partnership with the BOM *Water and the Land* (WATL) website has paid substantial dividends. In excess of 70,000 users visited WATL in February 2009, including the pages co-sponsored by MCV. b) The BOM has adopted the MCV approach of working with farmer reference groups to provide advice on website development to meet end-user needs. c) NAMS was subject to review by the incoming Australian Government and uncertainty remains about its future. d) MCV has developed a one-stop-shop climate website to specifically meet farmer needs in climate information—*Climate Kelpie* is ready to launch in 2009–10 and it is hoped a new MCV Managing Agent will enable this important site to go live.
Strategic and hopefully multi-partner investment into Northern Australia seasonal forecasting science.	Northern Australia seasonal forecasting science investment exceeds $1.5 million.	a) *Northern Australia Science Plan* was completed and negotiations were well underway with WA/NT/Qld State Governments expressing positive interest in co-investing to deliver the plan. The closure of LWA has stopped this process and its future is uncertain. b) Existing MCV partners had also expressed strong interest in providing additional funding toward delivery of this *Plan*.
Science innovations in climate research downscaling global circulation models	3 key science papers in publication describing innovations in climate research downscaling global circulation models	There have been at least eight science papers produced from MCV-funded projects, many have also been presented as conference papers. Topics are given under New knowledge.

National Program for Sustainable Irrigation (NPSI)

The *National Program for Sustainable Irrigation* (NPSI) invests in research, development and its adoption to improve the productivity and sustainability of irrigation in Australia. The current Phase 2 of the NPSI builds on over a decade of LWA-managed research in this field, initially through the *National Program for Irrigation Research and Development* (1994–2003) and then through Phase 1 of NPSI (2004–2007). The current phase of the Program is due to finish in 2010 with a small number of projects contracted to finish in 2011.

NPSI and its predecessors have been supported by a diverse range of partner investors including federal and state governments, research and development corporations and private companies. The current phase has 14 partners, reflecting the demand for a collaborative approach to irrigation research and development. This diversity is also evident in the range of research funded by the Program such as irrigation water application techniques—like precision irrigation, to issues such as managing irrigation salinity, through to understanding biodiversity on irrigation farms, demonstrating the wide range of research needs within the industry.

NPSI has invested $3.8 million in new research, with a further $0.8 million allocated to research as yet un-contracted due to LWA's closure. The bulk of current NPSI projects are in their first year or just completing their first year of research. The program has also made significant investments in supporting projects to develop and manage knowledge for adoption. This investment ensures NPSI-funded research meets the needs of end users.

With the closure of LWA, the Cotton Research and Development Corporation has agreed to take over as the new managing agent. Further information can be found at npsi.gov.au.

Executive Manager

Ms Anwen Lovett

Partners

- Australian Government Department of the Environment, Water, Heritage and the Arts
- Cotton Research & Development Corporation
- Gascoyne Water Co-operative Limited and Gascoyne Water Asset Mutual Co-operative Limited
- Goulburn-Murray Rural Water Corporation
- Grains Research & Development Corporation
- Harvey Water
- Horticulture Australia Limited
- Lower Murray Urban and Rural Water Authority
- Ord Irrigation Cooperative & Ord Irrigation Asset Mutual Cooperative
- South Australian Research & Development Institute
- Sugar Research & Development Corporation
- SunWater
- Western Australia Department of Water

Program duration

2007–08 to 2009–10

Expected program outcomes

- Substantial improvement in the environmental, economic and social performance of irrigation industries around Australia.

- Australian irrigation that is valued for its environmental, economic and social performance.
- National Water Initiatives enhanced with good science.
- A 10–year national irrigation R&D investment plan endorsed by industry, and stakeholders.
- Improved knowledge and skills of human resources in the irrigation sector.

Total expenditure budget for the program

$6.000 million (Phase 2)

Expenditure for 2008–09

$2.609 million (LWA $0.500 million)

Program highlights

Key highlights from the program during 2008–09 include:

- A recent return on investment evaluation of NPSI Phase 1 found a benefit cost ratio of 9:1. For the four projects evaluated, a $1.9 million investment, $17 million of returns have been generated.
- NPSI launched an initiative in 2008–09 supporting six undergraduate student scholarships. The intent of the scholarships is to assist in promoting and attracting people into irrigation R&D and to assist in capacity building.
- With substantial government investment being directed toward modernisation projects, NPSI hosted a *Modernisation Forum* which brought together water companies, researchers and the industry to share their experiences and to discuss future needs. Participants gave the event an overall rating of 9/10.
- The program has initiated or supported other significant forums to bring together industry stakeholders to address sustainable production in a water scarce environment including the *Irrigation Australia Conference*, workshops on selecting irrigation systems and evaporation science, an irrigation essentials workshop
- The program contracted 18 new projects during the year. As these projects build momentum increased outcomes are expected. The Program was successful in partnering with the National Water Commission which co-invested $0.435 million in two projects. DEWHA also committed a further $0.170 million to the program's research projects.
- NPSI prepared and submitted a strategic investment strategy, *Australian Irrigation Innovation Initiative for Healthy Rivers*, to the Australian Government seeking investment under the *Water for the Future* plan.
- NPSI with Irrigation Australia Ltd and the CRC for Irrigation Futures hosted an *Innovation in Irrigation Workshop*. The Workshop attracted 100 participants from across the irrigation industry including irrigators, policy makers, researchers, urban water organisations and rural water supply companies. The workshop aimed to develop a common vision and commitment to supporting irrigation innovation into the future. This vision will need to be much broader than the concepts developed for specific objectives of *The Water for the Future Plan*. Discussions from this workshop informed the development of the NPSI *Australian Irrigation Innovation Initiative for Healthy Rivers*.
- The Program has produced about 40 new publications during the year. The NPSI website has been upgraded in the past 12 months.

New knowledge

- Salinity Management Practice Guidelines for Winter Rainfall Zones.
- Final Report—Root zone water, salinity and nutrient management.
- Final Report—Management of Irrigation Water Storages: carry-over rights and capacity sharing.
- NPSI Phase 1 Return on Investment final report.
- ROI Harvey Irrigation Area.
- 2008 Undergraduate Student Scholarship Final Report—Investigation of Lake/Groundwater Interaction at Lake Tutchewop.

Events and activities

- *Modernisation Workshop*, 12–13 March, 2009, Shepparton.
- *Irrigation Essentials Workshop*, 26 March, 2009, Sydney.
- *NPSI Evaporation Workshop*, 6 November 2008.
- *Australian Cotton Conference*, August 2008.
- *NPSI Annual Partner Forum*, 1 September 2008.
- *NPSI Researcher Workshop*, 2–3 September 2008.
- *Innovation in Irrigation Workshop*, 16 September 2008.

The Program sponsored the *Irrigation Australia Ltd (IAL) Conference* on 20–22 May, 2008. The conference was attended by 820 delegates and the trade show had 3500 visitors. NPSI Program activities at the Conference were:

- Conducting a workshop on *Selecting Irrigation Systems* discussing the pros and cons of changing to different irrigation systems and R&D needs. This topic was chosen by the Program to discuss the practical issues of modernising irrigation infrastructure which is a cornerstone of the *Water for the Future Plan*
- The Program Coordinator gave a conference presentation and wrote a paper for the proceedings
- The 2008 NPSI/IAL Travel Fellow Kimberly Graham gave a presentation at the Conference on *Views on Irrigation Policy in Australia*
- NPSI projects presented at the conference by project leaders: *Northern Australian Irrigation Futures; Long Term Sustainability of Precision Irrigation; Irrigated Cotton & Grains Capacity building*, & *Root zone salinity*

NPSI also had trade displays at the inaugural *Central West Catchment Management Authority (CMA) WaterSmart Expo* in Narromine, the *Australian Cotton Conference* and *Energy in Irrigation Seminar* in Goondiwindi.

NPSI is sponsoring a technical meeting on evaporation losses in December 2009 at Griffith University. It is also sponsoring the *Irrigation Australia Conference* in November 2009.

Key Performance Indicators	2008-09 Targets	Achievement against targets
Improved management practices for irrigators	Projects funded that: ◗ increase understanding the environmental consequences of implementing more efficient technology, changes to delivery systems and management practices ◗ deliver technology improvements and management options to maximise water-use efficiency at the farm and delivery system scale	Nine projects have been funded to investigate new technology and management improvements. Areas include optimising use of aerated irrigation water, managing soil salinity, managing fertigation, reducing evaporation, quantifying surface groundwater exchange and understanding impact of changing irrigation strategies on biodiversity.
Adoption by irrigators of improved management practices	Projects funded that: ◗ build understanding of barriers and drivers of practice change and adoption by the irrigation industry ◗ improve current irrigation management practices and systems ◗ improve accessibility of knowledge, tools and practices to end users ◗ assist irrigators adapt to reduced and increasing variability in water supplies	Six projects have been funded which investigate farm dam management, adaptive learning, precision irrigation technology and its application, converting traditional rice farms; adopting best management practices in cotton and grains and management of irrigation storages. The NPSI Knowledge Broker visited all research projects during the first quarter of 2009 to assist with knowledge and adoption activities and take video footage of the research in the field. This video footage is being developed into two resources: short video clips on the NPSI website; and DVD compilations of each research project.

Key Performance Indicators	2008-09 Targets	Achievement against targets
National Water Initiatives enhanced with good science	A knowledge harvest of best management irrigation practices from the previous decade of R&D completed and accessible to government policy and programs	The NPSI Knowledge Harvest hosted two major workshops and produced a number of factsheets and short publications. These include: ◗ *Modernisation Forum* to assist the industry, researchers and governments to discuss future investment needs. ◗ *Irrigation Essentials workshop* with researchers, irrigators and key industry groups which identified the 10 key principles for increasing water use efficiency in irrigation. ◗ Factsheets and short publications that explore the role of irrigation in Australia and irrigation issues to assist in building awareness and understanding about the sector and the issues it faces. ◗ Two projects have been funded to investigate the use of evaporation reducing monolayers on irrigation channels and develop a tool to determine surface and groundwater interaction.
A 10-year vision for irrigation R&D	A 10–year national irrigation R&D investment plan completed and supported by government, research and industry stakeholders	The *Australian Irrigation Innovation Initiative for Healthy Rivers* Strategy was submitted in December 2008 to Ministers Wong and Burke.
Improved R&D capacity of research providers	1 IAL/NPSI Travel fellowship funded 5 NPSI Student Research Projects funded	NPSI Travel Fellowship was awarded to Mr Matthew Shanahan. Five NPSI Student Scholarships were funded.

Sustainable Landscapes Arena

Defeating the Weed Menace Program (DWM)

Defeating the Weed Menace R&D aimed to:

- provide research and knowledge management to support the *Defeating the Weed Menace program*, and to complement existing research on invasive plant species
- generate new knowledge and assimilate it with existing knowledge to help prevent the development of new weed problems, reduce the impact of existing weeds of national priority, and build capacity for their management into the future.

The focus of *Defeating the Weed Menace* R&D was on weed issues across Australia that are having impacts on extensive land systems and conservation areas, where the benefits are largely to the community as a whole. Further information on this program can be found at lwa.gov.au.

The *Defeating the Weed Menace* program concluded in April 2009. A series of six stakeholder forums are planned to assist in disseminating the knowledge gained from the program.

Executive Manager

Mr Jim Donaldson

Partners

- Australian Government Department of Agriculture, Fisheries and Forestry
- Australian Government Department of the Environment, Water, Heritage and the Arts

Program duration

2006–07 to 2008–09

Expected program outcomes

- Lowering the rate of emergence of new weed problems.
- Reducing the impacts of existing weed problems of national priority.
- Increasing the national capacity to manage weeds.
- Improving decision making on resource allocation to manage weeds.

Total expenditure budget for the program

$5.400 million

Expenditure for 2008–09

$1.547 million (All partner funding)

Program highlights

Key highlights from the program during 2008–09 include:

- the depth and breadth of knowledge products resulting from individual projects and synthesis of products from across the program
- the extent to which the program was able to facilitate collaborative effort between different projects and beyond the individual projects to synthesis of outcomes relevant to future weeds R&D
- the strong positive feedback obtained during external review of the DWM R&D program, especially given some of the challenges faced as a result of the program's development and complex management arrangements.

New knowledge

A wealth of new knowledge has been generated by *Defeating the Weed Menace* R&D. Collectively, the research highlighted the importance of: whole systems approaches and landscape-scale perspectives in weeds R&D; the need for improved understanding of climate change impacts and influences on weed spread and management; the need to include socio-economic and institutional dimensions of weed management into future R&D; and the need to continue to develop a nationally agreed information system or process for the collection, collation, storage and management of invasive species data to provide an essential foundation for ongoing weed management across the nation. There are also opportunities for Australian governments jointly to progress the integration of weed risk management and biological control prioritisation mechanisms so as to better target investment in biological control research.

Some of the knowledge generated by DWM includes:

- Buffel grass is highly prized by many pastoralists as an exotic pasture grass for livestock. It is also a major environmental weed with the potential to establish in over 60 per cent of mainland Australia. Dr Margaret Friedel and her colleagues from the CSIRO have provided a systematic documentation of the relative benefits and costs of Buffel grass to the environment and to pastoral production. Issues around eradication, reduction of spread, suppression and management for dominance are all discussed in their report. While the project did not 'quantify' costs and benefits in monetary terms, it provided a comprehensive account of the factors involved in determining costs and benefits and their perceived importance from both environmental and pastoral perspectives. The team has developed management recommendations for addressing the social barriers to changing the way Buffel grass is managed.
- Changes in temperature and water availability as a result of forecast climate change will increase the potential of some weed species to spread further in the future, while others might become less damaging than they are today. A systematic understanding of the potential for the future spread of weeds is important to all who need to control and manage their presence and impact. Dr John Scott (CSIRO) led a team which modelled the potential change in distribution of 'sleeper' and environmental 'alert' species due to climate change by taking *CLIMEX*, a program used to model species distributions, and combining it with *OzClim*, which is used to model climate change scenarios. The team has generated a comprehensive set of predictive distribution 'risk' maps for all current sleeper and alert weeds. This research will be useful at a broad policy and management planning level in addressing climate change adaptation as it relates to landscape management and the spread of weeds. It provides a valuable context within which further more detailed studies can be undertaken.
- One of the aims of the *Weeds of National Significance* (WoNS) program is to achieve sustainable long-term management of priority weeds that threaten Australia's natural ecosystems. Such programs fund major 'on-ground' activities to eradicate or control weed infestations. Whilst a reduction in the target weed is a major achievement for any weed control program, long-term success can

only be claimed once native ecological communities have recovered. Drs Adele Reid and Louise Morin from CSIRO Entomology led a team that evaluated the environmental benefits of controlling WoNS in natural ecosystems and analysed the extent to which these invaded ecosystems recover following successful removal/control of the weeds. Their research highlights the importance of long-term monitoring as being crucial to being able to evaluate the success of weed-control activities. They emphasise that a whole-system approach is required to integrate weed control with other actions designed to assist recovery of native plant communities.

- In the suite of weeds research projects funded as part of the *Defeating the Weed Menace* R&D program seven projects addressed the theme of 'biocontrol agents for national priority weeds'. They targeted weeds such as Noogoora Burr, Boneseed, Alligator Weed, Parkinsonia, Cape Broom, Mesquite, Salvinia and Scotch Broom. The outcomes of the projects confirmed that, while biological control is a highly suitable and desirable method for weed control in Australia, it is not a 'silver bullet' that is a complete answer to weed management. Unpredictability in efficacy of the biocontrol agents, once released, remains as a limitation and biological control must be integrated with other weed management tactics to deliver successful production and biodiversity outcomes. The need for a long-term commitment of both time and money to achieve successful biocontrol programs was emphasised and there is an urgent need for improved monitoring and evaluation. Current short-term funding cycles do not encourage long-term evaluation which means that knowledge about outcomes often remains uncertain.
- To assist in prioritising future research into biological control of weeds that provide the greatest return on investment, Landcare Research New Zealand was commissioned to develop a decision-making framework to maximise the likely effectiveness of investment in biocontrol research and to ensure this is done in ways that are transparent and repeatable. Three key dimensions influencing the priority of a weed as a target for biocontrol were identified: importance of the weed; likely impact of biocontrol; and effort required. The framework was reviewed by researchers and policy advisers around Australia and can be used to develop an overall score for the priority of the species as a target for biocontrol and thereby assist in decision making.
- Weed management agencies in Australia support the principle that prioritisation of and investment in weed management should be informed by a risk management approach. Dr Samantha Setterfield (Charles Darwin University) and colleagues used Gamba grass and Para grass as pilot species to develop and trial tools for evaluating the benefits and costs of different control methods in limiting the negative environmental impacts of invasive grasses which have agricultural economic benefits. The research highlighted the diversity of categories into which Gamba management costs fall—anticipatory costs, response costs (especially in fire management), consequential costs and weed-control costs. Using a case study and measurable parameters for both environmental and social impacts, the benefit-cost modelling allowed the team to develop a decision-making tool to assess relative cost-effectiveness of alternative control

measures for Gamba grass, which is already being used by the Northern Territory and Queensland governments.

- Many exotic weeds have colonised floodplain and riparian environments in Australia and these weeds can have substantial negative impacts on the biodiversity values of riparian environments as well as adjacent agricultural land. Drs Matthew Colloff and Kate Stokes (CSIRO Entomology) developed management guidelines to assist in managing weed invasion and spread in floodplains likely to be subjected to increased inundation as a result of increased environmental water flows in the Murray River. They found that invasion at the site scale is regulated more by periodic inundation than by competition with native plant species, and that active management of environmental flows can be used to favour native species. This research has potential to significantly influence the ways in which environmental flows and their implications for weediness of floodplain areas are managed.
- Both farm management and biophysical factors have been identified as influencing serrated tussock invasion on grazing properties. Property owners differ widely in their ability to keep this invasive perennial plant under control. Given the devastating effects of serrated tussock on both livestock production and biodiversity, improved understanding of the management practices that prevent spread of this aggressive weed are important to its future control. Professor David Kemp and Dr Aaron Simmons from Charles Sturt University identified that disturbance plays a key role in the establishment of serrated tussock and that the use of control techniques such as chipping and spot spraying are likely to be more effective because they produce minimal disturbance. They found that constant and vigilant control that creates minimal disturbance is essential to stop invasion and that the belief that grazing a pasture with sheep will lead to more serrated tussock than if grazed with cattle was not supported. The results have been incorporated into the *Serrated Tussock National Best Practice Manual*.
- Many significant eucalypt woodlands remnants are on farms and surrounded by agricultural land. Until recently, little was known of the impacts of grazing management on soil nutrients and resulting invasion by weed species that compete with the native tree species and their understory in these important remnants. Drs Elizabeth Lindsay and Saul Cunningham (CSIRO Entomology) sought to improving understanding of interactions between disturbance levels associated with land use change, nutrient levels in the soil and weed invasion. They found that removal of cattle and sheep for extended periods, or permanently, reduced nutrient inputs and through this exotic plant seed invasion, which potentially allows more native species to re-establish. This research makes a valuable contribution to the knowledge needed to underpin future management and rehabilitation of remnant grassy woodland communities in areas subject to different levels of grazing.

Events and activities

Several of the projects included in their DWM R&D work one or more stakeholder field days or workshops.

LWA also conducted six stakeholder workshops:

- *Knowledge assimilation workshop*, February 2008
  37 participants
- *Inaugural SA Weed Society conference*, October 2008, Adelaide
  input, approx. 100 registrants attended the conference
- *Stakeholder workshop addressing species with both commercial value and significant weed impacts*, 23 July 2008, Canberra
  approx. 25 participants
- *Stakeholder feedback forum to assist in developing a framework for weed biocontrol*, October 2008, Canberra
  approx. 25 participants
- *16th Australian Weeds Committee conference*, May 2008
  held a program outcomes and future directions workshop, several hundred registrants at the conference, approx. 10 attended the LWA DWM-sponsored forum
- *Forum for Canberra-based policy and program staff*, March 2009
  25–30 participants.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Engagement with key audiences leading to enhanced capacity to manage weed problems and reduce the impact of weeds	• Workshops, meetings and publications to support dissemination of project knowledge into practice • All finalising projects produce scientific papers in appropriate academic journals • Information from final projects disseminated to policy advisors, regional NRM bodies and weed managers • At least one edition of *Thinking Bush* published	• Several workshops completed, as outlined in the Events section above • Almost all of the 27 DWM R&D projects have prepared or are preparing scientific papers for publication in peer-reviewed journals • Dissemination has begun through *Thinking Bush,* a policy forum held in Canberra in March 2009, and the production of a suite of 13 synthesis publications and fact sheets. Further dissemination is planned through a series of workshops in each jurisdiction in 2009 under a project funded by the Australian Weed Research Centre. • *Thinking Bush: Thinking Weeds* released March 2009

Environmental Water Allocation Program (EWA)

The goal of the *Environmental Water Allocation Program* was to provide research which enables the benefits of water allocated for environmental purposes to be better assessed and understood.

The *Environmental Water Allocation Program* aimed to engage with policy advisors, water managers and regional communities to build upon the knowledge required for managing our rivers and waterways in a healthy state. More effective use of water resources is required in Australia to achieve the multiple aims of viable agriculture, industries, communities and the environment. Further information can be found at lwa.gov.au.

This program ends with the closure of LWA.

Executive Manager

Mr Jim Donaldson

Partners

- Australian Government Department of the Environment, Water, Heritage and the Arts
- Murray-Darling Basin Commission

Program duration

Commenced in 2004–2005 and was an ongoing program under the *2005–2010 Strategic R&D Plan*.

Expected program outcomes

- Improved methods for monitoring and evaluating environmental water allocation.
- More effective engagement of researchers with managers in designing environmental allocations.
- Improved ability for policy makers, planners and managers, particularly regional groups, to make decisions on water allocation.
- Improved understanding of water needs of aquatic ecosystems across Australia.
- Improved understanding of the opportunities and threats to water availability.

Total expenditure budget for the program

$5.300 million

Expenditure for 2008–09

$0.926 million (LWA $0.613 million)

Program highlights

In partnership with the National Water Commission, DEWHA and the Murray-Darling Basin Authority, the EWA program held a national *Environmental Water Allocation Forum* in May 2009. The forum successfully demonstrated LWA's ability to bring together scientists, policy makers and water managers to (1) review the current state of knowledge about environmental water management and allocation; (2) provide a forum for scientists, managers and policy makers from across the country to share their knowledge and discuss future needs and directions; and (3) identify information and knowledge gaps, and future research priorities.

The forum included small group workshop sessions and presentations from key researchers in the EWA program including Dr Belinda Robson, Professor Richard Kingsford, Professor George Ganf and Professor Mike Young. The discussions focused on the challenges of environmental water allocations in regulated and unregulated systems, policy and other instruments for achieving environmental water allocation, and the linking of environmental water allocations to the broader context of regional water plans.

The event was a huge success and was well attended by 150 delegates including water scientists, water managers, and State and Commonwealth policy makers.

New knowledge

Dr Belinda Robson's project, *Environmental water allocation required to sustain animal species in ephemeral streams*, completed a draft final report on the environmental water required to sustain macroinvertebrate species in ephemeral streams including the importance of perennial pools as refuges for fish and invertebrates and recommendations for managing flow-habitat relationships in ephemeral streams to assist decisions on water allocation and management.

Dr George Ganf's project, *Water allocation to River Murray wetlands: a basin wide modelling approach,* produced a model that predicts the influence of various additional environmental flows on wetland plant biodiversity. Results from 19 reaches were collated to provide a composite picture that is used to estimate the connectivity of wetlands, the probability of presence of wetland plants within these wetlands and how these parameters change with proportional changes in river discharge. Results show that an additional flow target of between 2,000–3,000 gigalitres would substantially increase the potential for wetland restoration.

The environmental assets of the Coorong and Murray Mouth region in South Australia are under threat as a result of ongoing changes in the hydrological regime of the River Murray. Associate Professor Justin Brookes and Dr Kane Aldridge's project, *Flow requirements and resource delivery to the Lower Murray Lakes and Northern Coorong* has developed models that forecast how environmental flow manipulations in the lower lakes (Lake Alexandrina and Lake Albert) affect primary productivity, and change the supply of organic matter and nutrients to the Coorong and Murray near shore environment. In particular it has:

- set up and calibrated a three-dimensional hydrodynamic-ecological model that is currently being used by management agencies
- produced a final peer-reviewed report on the nutrient/ion budget and made it available to management agencies
- developed a Bayesian model to predict the distribution of *Ruppia* in the Coorong.

The project also forms part of a larger CSIRO Coorong, Lower Lakes and Murray Mouth research program (*CLLAMMecology*) that is undertaking extensive field-based research into ecosystem response to flow changes in the Coorong and Lower Lakes. The research team has contributed significantly to the management of the region as much effort has been placed on conveying the information generated within the project to relevant stakeholders including management agencies with responsibility for salinity and water quality management in the lower lakes and the Coorong.

Professor Richard Kingsford's project, *Adaptive management of environmental flows in the regulated Macquarie River*, developed an initial model of flow and inundation patterns in the Macquarie Marshes and their relationship to rainfall using the *Locally estimated scatterplot smoothing* (LOESS) method. The model can be used to generate natural and regulated inundation areas and in the future could be used to assess the long-term effects of changing rainfall that may result from climate change. The model could also estimate the potential impacts of increased flow and resultant inundation within the Macquarie Marshes as a result of environmental water buy back from irrigation.

Professor Mike Young's project, *With the Wisdom of Hindsight: Reconsidering Institutional Arrangements for Water,* sought to go back to first principles and search for the most effective ways to allocate water to the environment, particularly in the Murray-Darling Basin. This project has successfully been generating innovative policy ideas and frameworks for thinking about how to allocate and manage water in the Basin; it continues to make a significant impact on water policy and planning in Australia and internationally. In all, seventeen *Droplets* (briefing notes designed to express ideas about water reform) were completed and distributed to an email list of over 7,000 people. For example, this included *Droplets* on 'Shepherding water—identifying a way to define rights to the water from unregulated streams so that water rights can be moved from one location to another' and 'Less River —identifying the need and ways to prioritise the use of environmental water in a scenario of an enduring dry climate'.

Assoc Professor Michael Douglas' project, *Water regime dependence of fish in the wet-dry tropics,* has improved our understanding of the potential ecological impacts of changes in dry season flow regimes of tropical river ecosystems caused by water resources development in these catchments. The project investigated variation in fish distribution and ecological requirements across a natural flow regime gradient using field sites, and documented Indigenous knowledge on fish in the Daly River of the Northern Territory. Aboriginal traditional owners (Wagiman and Wardaman) were involved in the fish research, including recording their knowledge of fish, their biology and behaviour and their social and cultural significance. This information has been used to develop models, based on Bayesian Belief Networks, to predict the impact of different water allocation scenarios on freshwater fish in key areas of the catchment. The project has also developed enduring collaborations that will enhance the capacity of managers in the Northern Territory.

Dr Peter Dillon from the CSIRO conducted a review of the *Risks to Groundwater Dependent Ecosystems from Managed Aquifer Recharge*. This report was commissioned at the request of the Department of the Environment, Water, Heritage and the Arts to inform and support the development of the *Guidelines for Management of Aquifer Recharge under the National Water Quality Management Strategy*. The report has filled a gap in knowledge; it identified methods for measuring impacts and determined acceptance criteria for environmental risk assessment and methods to manage those risks. As a result the national guidelines, which guide decision making by government agencies in Australia, have now been updated.

Events and activities

- *Knowledge Assimilation Forum*, November 2008
  attended by the EWA program's researchers, Program Management Committee members, and representatives from DEWHA, the National Water Commission (NWC) and the Murray-Darling Basin Authority (MDBA). A major outcome of the day was a discussion on various ways to market what has been done in the program as well as to facilitate a discussion on a proposed national forum to bring together researchers, policy makers and water managers to explore the state of play of the science and identify future directions and gaps that could be considered for future programs.
- *Environmental Water Allocation Forum*, May 2009, National Museum, Canberra
  well attended by 150 invited delegates including water scientists, water managers, and State and Commonwealth policy makers. Proceedings from the forum include podcasts and videos of the presentations and are available on both the LWA and National Water Commission websites.
- *47th National congress of the Australian Society for Limnology,* May 2009, Mandurah, WA
  Dr Belinda Robson presented findings on her environmental water project.
- *Environmental Water Forum,* May 2009, Canberra
  Dr Belinda Robson presented findings on her environmental water project.
- Project brief, *Lower Lakes as a food source for the Coorong and Murray Mouth*,
  on CSIRO's website, csiro.au/partnerships/CLLAMMLWAPartnership.html
- *CLLAMMecology progress meeting*, October 2008
  oral presentation attended by operation and policy members of South Australian Departments of Water, Land and Biodiversity Conservation, and Environment and Heritage, Murray-Darling Basin Commission, CSIRO and *CLLAMMecology*.
- *Additional oral presentations*, 2008
  - Tailem Bend Community on behalf of SA Murray-Darling Basin NRM Board on the role of science, August
  - Goolwa to Wellington Local Action Planning Group, October
  - Global Lake and Estuary Observation Network, October
  - LWA in Canberra, November
  - National Estuaries Network, November
  - Glenel Rotary Club, November.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Engagement of key audiences to disseminate project knowledge on improved methods to monitor and evaluate environmental water allocation, needs of aquatic ecosystems, opportunities and threats to water availability	◗ Workshops, meetings and publications to support dissemination of project knowledge into practice ◗ All finalising projects produce scientific papers in appropriate academic journals ◗ Final projects produce information for water policy advisors and water managers	◗ EWA *Program Knowledge Assimilation Workshop* held with researchers and policy people to assist with dissemination and adoption of research outputs. ◗ *Environmental Water Forum* held in May 2009 to disseminate and share knowledge between scientists, water managers and policy people. ◗ Briefing papers and presentations provided to water management agencies on the management of Murray River lower lakes and Coorong.

Joint Venture Agroforestry Program (JVAP)

This program, which ended in June 2009, was managed by the Rural Industries Research and Development Corporation (RIRDC) with the aim of providing the knowledge to underpin profitable, sustainable and resilient agroforestry within Australian farming systems and landscapes. LWA invested in the RIRDC collaboration. Further information can be found at rirdc.gov.au.

Executive Manager

Mr Jim Donaldson

Partners

- Rural Industries Research and Development Corporation
- Forest and Wood Products Australia
- Murray-Darling Basin Commission (9 years)
- The Australian Government

Program duration

1992–93 to 2008–09

Expected program outcomes

- Improved agroforestry designs to optimise social, economic and environmental factors at the paddock, farm and regional-landscape scale.
- New commercial products and value-added existing products, to promote profitable agroforestry industries.
- Improved product-market linkages through analysing product suitability, value and regional development options.
- Demonstrated mechanisms for valuation and trading of ecosystem services provided by agroforestry.
- New policy and institutional arrangements that stimulate agroforestry investment.

Total expenditure budget for the program

$29 million (This is total program expenditure; LWA has contributed to this program since its inception)

Expenditure for 2008–09

Land & Water Australia's contribution was $0.450 million

Program highlights

Key highlights from the program during 2008–09 include:

- completion of JVAP review (and related draft *Five Year R&D Plan*), including feedback from two independent reviewers (Dr Glen Kile and Mr Andrew Campbell)
- completion of benefit-cost analysis of three randomly-selected JVAP projects (by AgTrans)
- publication of JVAP highlights report (*Fifteen years of the Joint Venture Agroforestry Program—Foundation for the tree crop revolution* by Optimal ICM) and launch at LWA/Greening Australia (GA) *Science in the Paddock* breakfast seminar
- development of post-JVAP business case and supporting Board papers for the three core partners
- publication of co-investors prospectus for *Woody Crops on Farms* initiative and announcement at LWA/GA *Science in the Paddock* breakfast seminar
- financial commitment from RIRDC and GRDC to the developmental year for *Woody Crops on Farms*, and in-kind support from the Future Farm Industries CRC
- liaison with other prospective funders (eg Meat & Livestock Australia Limited (MLA), Australian Wool Innovation Limited (AWI), MDBA, DAFF)

- development and implementation of the JVAP communication strategy for 2008–09, including:
  - publishing a significant number of final research reports online; representing the full suite of funded projects
  - updated and distributed JVAP promotional brochure
  - RIRDC launched a new website in February, including pages for JVAP
  - JVAP—related articles published or accepted for publishing in the following:
    - *Farming Ahead* (Kondinin Group; Dec 08)
    - *Australian Forest Grower magazine* (Spring & Summer 08 and Winter 09), including inside front cover and back page advertisements (Australian Forest Growers)
    - *Ground Cover* (Grains Research & Development Corporation; Dec 08)
    - *Focus on Perennials* (Future Farm Industries CRC; Dec 08 & Mar 09)
    - *Future Farmer* (Future Farm Industries CRC; Dec 08)
    - *Countryman newspaper* (WA) editorial, including advertisement (Nov 08)
    - *Thinking Bush* (Land & Water Australia; Oct 08 & two articles in Jun 09)
    - *Australian Agroforestry* (Mar 09)
    - *Be Magazine* (CQU; Aug 09)
    - *Rural Diversity* (RIRDC; Aug 09)
    - *Applied Environmental Decision Analysis* (Jun 09)
    - *Australian Forests and Timber News* (Dec 08)
    - *Tasmanian Farmer* (Dec 08)
- some highlights from individual projects include:
  - The *Master TreeGrower program* has been funded by JVAP since 1997. It has been a major vehicle for farm forestry participatory learning, through courses with landholders and extension staff. Co-funding was from University of Melbourne, and regional agencies that participated in the courses and provided expert input.
  - The *Farm forestry Toolbox* is the most widely used extension and farm decision tool to assist farmers to map, measure and manage their forest stands. JVAP funded the upgrade to version 5, which includes increased user-friendly mapping capability, and added a wide range of species and growth models from around Australia.
  - *FloraSearch*—after trawling through 1200 prospective native species in southern Australia, testing basic qualities of 120 species, and evaluating a wide range in field trials, *FloraSearch* chose 10 development and focus species for detailed plant breeding and product evaluation. The goal was to design integrated farming systems for southern Australia, for biomass and fodder production. A sophisticated GIS-based analysis, called RIPA (*Regional Industry Potential Analysis*), can map and evaluate economics of various production systems including comparison with regional agricultural returns. *FloraSearch* involved NSW, SA and WA researchers from CRC Future Farm Industries.
  - *Enrich*—co-funded by CRC Future Farm Industries, MLA, AWI and JVAP, this project evaluated native woody shrub species for use as fodder in integrated

grazing systems. The project included plant chemical analysis, grazing trials and modelling of optimum farm design and economics, based on surveys of actual fodder shrub farming. These systems are readily adopted by planting fodder shrubs on up to 20 per cent of the farm, generally on less productive land, with demonstrable improvements in whole farm returns and carbon sequestration.

- The *Australian Low Rainfall Tree Improvement Group* (ALRTIG), a collaboration between NSW, Victoria, SA and WA state forestry departments and CSIRO and JVAP, is improving species for low-rainfall regions of southern Australia, and managing seed orchards for future seed supply. The first improved seed was recently collected from seed orchards planted in phase 1 of the ALRTIG (now in phase 3). This seed can improve the growth rate and commercial viability of plantings in low- to medium-rainfall zones, whether they are for timber, carbon, biomass energy or multiple products.

New knowledge

2008–09 was a busy year for finalising reports as the program came to an end. A list of JVAP reports produced in 2008–09 is listed in Appendix 3. A great deal of new knowledge has been communicated in these reports. For example, much research has been done to evaluate a range of new industrial, agricultural and biomedical product options, such as eucalyptus oils, fodder, innovative wood products, biomass, and the use of bio-derivatives for pharmaceutical and chemical applications. Knowledge also continues to be generated around the economics of farm forestry and identifying potential new markets, such as for ecosystem services, and around improving market-supply processes for small-scale growers. A third major area where new knowledge has been generated concerns environmental sustainability issues and commercial farm forestry, for example, how to enhance nature conservation outcomes in plantations and regrowth forests, and how to use perennial vegetation to address dryland salinity. Some further examples of this new knowledge are:

- Mr Andrew Lang and his colleagues from the SMARTimbers Cooperative Ltd have undertaken a review which provides advice to small-scale growers and farm forestry groups about value-adding options for aggregated log supplies. The aim was to develop a predictable and more positive supply chain economics for small-scale farm forestry so that doubts about the returns for final products are reduced as an impediment to the expansion of farm forestry. The review presents information on a range of issues to do with log quality, milling dimensions and patterns, approaches to docking, grading at the mill, rack making, drying and storage, freight efficiencies, and product range and profiling issues involved with the production of quality products intended for both niche and broader commercial markets.
- Mr Mark Parsons and Mr Philip Pritchard (Bureau of Rural Sciences) undertook a review of the role, values and potential of Australia's private native forests to increase public and government awareness of private native forestry issues. Their report focuses primarily on forests where wood production is one of the management objectives. Among other things, they found most landowners want

to manage their forests to provide timber and other products and services in the long term while 20 per cent to 30 per cent would prefer to get rid of their native forests. While these forests provide a significant proportion of Australia's native forest timber supply, there is insufficient information to assess whether the rate of harvest is sustainable. They suggest a need for further education, extension and research activities including: mapping the ecological vegetation classes of private native forests to enable assessment of their conservation values; assessing the impacts of codes of practice and other regulatory requirements on harvestable timber resources; and assessing the financial and economic values of private native forests to regional communities. The report will help government agencies identify those regions where there is a serious dearth of information on the sustainability of harvesting and to target extension activities to private native forest operators.

- Development of agroforestry has been impeded by a lack of clear identification of regions and particular agroforestry systems with the greatest opportunities for commercial investment and environmental outcomes. Dr Phil Polglase and his colleagues (CSIRO) examined the opportunities for different agroforestry systems across regions in Australia, including in relation to potential infrastructure and carbon markets. They assessed the profitability of various systems within a spatial framework and the potential impacts of new agroforestry developments on water interception and biodiversity. The resulting database and spatial outputs identify regions where agroforestry is likely to be profitable; they provide a rich resource for ongoing assessment of opportunities for investors. This analysis found that carbon farming looks promising due to the relatively low cost of production (no harvesting, transport) relative to a possibly high product price.
- Mr Trevor Hobbs, Mr Mike Bennell (SA Dept of Water, Land & Biodiversity Conservation) and Mr John Bartle (WA Dept of Environment and Conservation) led the latest phase of the *FloraSearch* project to identify Australian agroforestry and fodder shrub species with the greatest potential for development as broadscale commercial woody biomass crops in the lower rainfall regions of southern Australia. In a series of three reports, they provide:
  - detailed species reviews of Koojong / Orange Wattle (*Acacia saligna*), Old Man Saltbush (*Atriplex nummularia*) and Flooded Gum (*Eucalyptus rudis*) with a focus on their taxonomy, ecology, biology, agronomy and potential for domestication as woody biomass crops for Australian dryland farming systems
  - detailed information on species performance through evaluations of field trials and data collated from other sources, new information on woody crop agronomy and management practices and their influence on woody crop production
  - information on the potential markets, economic drivers and spatial influences on developing commercial woody biomass crops in lower rainfall regions of southern Australia, with a focus on bioenergy crops and opportunities for electricity generation and creation of liquid biofuels to replace fossil fuel consumption in Australia.

Events and activities

- *JVAP Technical Advisory Committee meetings*, 1 August and 3 December 2008, Canberra.
- *JVAP Management Committee* (partners) teleconferences, 25 November 2008.
- *Veg Partners meetings*, 22 July 2008 and 2 April 2009.
- *Veg Futures 08*, 20–23 October 2008, Toowoomba
  JVAP was a major sponsor and provided a trade booth; Alex Campbell gave a keynote address - *The JVAP contribution: Redefining the boundaries.*
- *Australian Forest Growers biennial conference*, 19–22 October 2008, Albury
  JVAP was a major sponsor and provided a trade booth; Bruce Munday chaired a forest policy session.
- *Private Forestry community field day*, Mt Lofty Ranges SA.
- *Master TreeGrowers Muster*, 31 March–1 April 2009, Otways.
- *Workshop on Farm Forestry Toolbox Version 5.0*, 19 November 2008, Canberra
  convened by Adrian Goodwin with 10 attendees.
- *Meeting with a delegation led by the Minister for Natural Resources from the Canadian province of Alberta*, January 2009.
- LWA/GA *Science in the Paddock* breakfast seminar, 17 June 2009, Canberra
  input to program development and delivery.
- *Master TreeGrower/Otways Agrofestry Network*, April–June 2009
  events related to dialogue with Australian Government (Ministers Burke and Crean).
- *Strategic planning session* with LWA staff, 20 February 2009.
- *RIRDC Strategic Issues Forum*, 8–9 September 2008.

Key Performance Indicators	2008–09 Targets	Achievement against targets
A major review of the JVAP program 2003–08 A new five-year plan to be developed for 2009–14	◗ Stakeholder commitment to a new five-year investment plan for farm forestry R&D	◗ See Ewing M, Bulinski J and Gibbs D 2009, *Review of the Joint Venture Agroforestry Program 2004–2009*, RIRDC, Canberra. ◗ See Attachment to Ewing *et al.* 2009, *Draft Five Year R&D Plan 'Woody Crops on Farms' 2010–2015*. ◗ Financial commitment from RIRDC, MDBA and GRDC to the developmental year, and in-kind support from Future Farm Industries CRC.
Increased awareness by regional and catchment management groups, industry and government of the role and value of farm forestry and woody shrub farming systems	◗ Development of a communication plan for JVAP for 2008–09 ◗ Stakeholder involvement in identifying and communicating key research results	◗ See *Draft JVAP Communications Strategy—2008–09* approved by JVAP Technical Advisory Committee on 1 August 2008. ◗ Strategy informed by two internal research reports (*Case studies in farm forestry research dissemination* and *Adoption and impact of farm forestry research—recommendations for the JVAP program*). ◗ Strategy implementation discussed above.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Synthesis of JVAP research and communication to landholders, regional natural resource management groups and government	◗ Updated guidelines on improving biodiversity in farm forests and shelterbelts ◗ Mallee biomass data incorporated into the Farm Forestry Toolbox ◗ Workshops and easy-to-use research summaries on key farm forestry and agroforestry topics	◗ See Powell J 2009, *Fifteen years of the Joint Venture Agroforestry Program—Foundation research for Australia's tree crop revolution*, RIRDC Publication No. 09/63, Canberra. ◗ *Guidelines for Victorian private native forest managers* (published online) ◗ *A review of timber production, biodiversity and soil and water indicators* (published online) ◗ *Management principles and strategies to guide biodiversity conservation in private native forests* (published online) ◗ *Farm trees: Enhancing biodiversity, nature conservation and pest control* (published online)
Evaluation of woody native species for new farming systems for southern Australia, including use as fodder, biomass and carbon	◗ Evaluation of the profitability of using shrubs as part of mixed grazing systems	◗ Seven *FloraSearch* reports (published online) ◗ *Enrich* final report accepted but not published (commercial in confidence)
Improvement of direct seeding techniques and reliability for broad-scale revegetation	◗ Evaluation of the germination and field sowing requirements of key direct-seeded species	◗ Four Greening Australia reports: one on direct seeding and three on species trials (published online) ◗ *Improved direct seeding establishment of commercial native plants*, final report (in prep)

Native Vegetation and Biodiversity Program (NVB)

The aims of the *Native Vegetation and Biodiversity Program* were to:

- understand and value the role of native vegetation and biodiversity in the delivery of ecosystem services
- underpin the effective and efficient retention and restoration of native vegetation to improve the conservation of native plants and animals
- identify management regimes for native vegetation that improve biodiversity values and ecosystem services at the landscape scale
- build capacity for adoption and application of knowledge to achieve the maintenance or restoration of healthy landscapes.

The management of native vegetation and biodiversity continued to be a priority issue for research investment by Land & Water Australia because of the critical role of vegetation in providing ecosystem services, conserving biodiversity, improving landscape function, enhancing production and mitigating climate change through carbon sequestration. Further information can be found at lwa.gov.au.

This program ends with the closure of LWA.

Executive Manager

Mr Jim Donaldson

Partners

- CSIRO
- Greening Australia

Program duration

Commenced in 2004–05 and was an ongoing program under the *2005–2010 Strategic R&D Plan*.

Expected program outcomes

- Improved understanding and valuing of the role of native vegetation and biodiversity in the delivery of ecosystem service.
- Effective and efficient retention and restoration of native vegetation to improve the conservation of native plants and animals.
- Management regimes for native vegetation that improve biodiversity values and ecosystems services at the landscape scale.
- Greater capacity for adoption and application of knowledge to achieve the maintenance and restoration of healthy landscapes.

Total expenditure budget for the program

$5.700 million

Expenditure for 2008–09

$1.183 million (LWA $0.954 million)

Program highlights

Key highlights from the program during 2008–09 include:

- Land & Water Australia co-convened a successful *Veg Futures 08* conference in Toowoomba from 20–23 October 2008. Nearly 400 delegates attended from a range of non-government organisations (NGOs), government and research agencies, and community groups. Keynote speakers and a number of concurrent sessions tackled major themes such as carbon markets, landscape restoration, market-based instruments, cross-regional bio-link projects, and valuing biodiversity and ecosystem services. The LWA stand in the trade display area was popular and featured a number of new fact sheets describing recent findings

from *Native Vegetation and Biodiversity* projects. Land & Water Australia personnel, including Mrs Bobbie Brazil, Dr Michael Robinson, Prof. Ted Lefroy, Mr Jim Donaldson, Dr Mick Quirk and Dr Stuart Pearson hosted or chaired sessions during the conference.

- Prof. David Lindenmayer had two major books published, one an ecological synthesis of 14 years of landscape-scale vegetation research at Tumut, west of Canberra (*Large-scale landscape experiments. Lesson from Tumut*. Cambridge University Press, Cambridge); the other a collaborative analysis of the key strategies required to tackle Australia's environmental problems (*Ten Commitments: Reshaping the Lucky Country's Environment*. CSIRO Publishing, Melbourne).
- The *Master TreeGrower* (MTG) National Review workshop was held on March 31st – April 1st, 2009 at Deans Marsh, Victoria. Since 1996, more than 80 regional MTG courses involving 1600 landholders and 30 partner organisations have been held across Australia, promoting the benefits and practice of Agroforestry. LWA has been a co-investor in the MTG program through both the Joint Venture Agroforestry program and, more recently, the Native Vegetation program, with the latter investment helping promote the on-farm restoration and management of native vegetation.
- The Program Management Committee (PMC), with a new Chair and Board representatives, met for the first time in December. The PMC prioritised knowledge and adoption (K&A) initiatives and commissioned development of a plan for future LWA investment in native vegetation and biodiversity R&D.
- The annual program meeting in August 2008 indicated tremendous support and energy for both integrating program K&A activities across projects and helping prioritise future R&D needs.
- The significance, and emerging impact, of outputs from projects, either completed or nearing completion, on retention, restoration and management of native vegetation.

New knowledge

Delivery of ecosystem services

Dr Nancy Schellhorn (CSIRO) is quantifying the benefits of native vegetation remnants for pest control in cotton and grain systems in southern Queensland, testing if a high native remnant to arable land ratio results in greater pest suppression, and revealing the spatial scales at which remnant areas contribute to pest control. The first season of field work and data analysis, in the study landscapes in the Condamine region of southern Qld, has been completed. This quantified pest and natural enemy colonisation on cotton seedlings and their sink and source habitats. A simulation model was developed to study how the spatial arrangement of sink and source habitats affects pest control.

Dr Chris Stokes (CSIRO) has developed analytical tools to assist cattle producers in northern Australia decide where additional grazing properties or sources of agistment might be best located to help minimise the impacts of climate variability. This will help avoid some of the current problems associated with declining native vegetation condition during drought. The research has quantified patterns in rainfall and forage growth that are not coincident in time or rate (ie patterns of 'asynchronicity') within and across regions, using time-series satellite data and pasture-growth modelling. Results

have been mapped via a GIS decision tool to help locate temporal patterns of resource asynchronicity that may benefit a pastoral enterprise. The tools and their outputs were evaluated with 14 pastoral enterprises located across northern Australia.

Dr Jeremy Russell-Smith (Tropical Savannas CRC) is building on recent success in engaging with Indigenous communities to improve fire management of northern Australian tropical woodlands through payment for environmental services (carbon offsets). The project has identified the most effective ways to (1) engage with Aboriginal communities, (2) reduce uncertainty about the influence of fire management on greenhouse gas emissions and carbon sink strength (especially at regional scales), (3) improve cost effectiveness of aerial ignition, and (4) provide assessments of fuel curing at large scales. Models and decision tools are informing fire management planning and operations by predicting fire spread and landscape impacts. The project has also assessed the accuracy and precision of the current carbon assessment toolkit (National Carbon Accounting System) when applied to tropical savannas. Each year, the project organises workshops for Indigenous rangers to plan for the upcoming fire season. During 2009, in addition to the Western Arnhem Land project area, planning meetings were also held for the new Gulf project area, which covers 60,000 square kilometres straddling the NT-Qld border.

Retention and restoration of native vegetation

Prof. David Lindenmayer (ANU) has applied new methods of data analysis and synthesis of information to identify general patterns of biodiversity response across a range of studies including five landscape experiments, established for up to 23 years, in south-east Australia. Data on bird, reptile and mammal abundance from forest, woodland, and heathland sites has helped test general theories underpinning conservation strategies including: (1) the importance of vegetation structure as a surrogate for species richness, (2) the impact of disturbance on species richness, (3) functional redundancy, (4) the utility of species-abundance curves, and (5) concepts of connectivity and heterogeneity. Outputs are underpinning more effective landscape design and the associated investments in conservation of biodiversity.

Dr Jim Radford (Deakin University) has built on earlier project work in northern Victoria that took a 'snapshot' of faunal biodiversity in contrasting landscapes and which suggested that 30 per cent or more vegetation cover was required within a region to maintain most bird species. However, such snapshots of biodiversity imply or assume 'stable' populations whereas populations of some species may still be responding (declining or increasing) to the changed landscape. Resampling these landscapes has shown that woodland birds in agricultural landscapes of north-central Victoria are declining faster than previously realised. The legacy of clearing large tracts of native vegetation and the ongoing degradation of remnant vegetation appear to have been compounded by a decade of very dry conditions, culminating in widespread population declines and the disappearance of many species from local landscapes. The trend for faster species loss in higher cover and less fragmented landscapes is consistent with the expression of an 'extinction debt' in its later phases. That is, a time lag effect in which the consequences of historical clearing and landscape modification are continuing to be realised as species are lost progressively from the

most modified landscapes to less modified landscapes. The threshold relationship between landscape-level tree cover and species richness of woodland-dependent birds detected in 2002–03 was re-affirmed in the 2006–07 data.

Dr Tony Griffith (Tropical Savannas CRC) has improved our understanding of relationships between vegetation pattern and biodiversity in the Daly River region, an area under increasing pressure for agricultural development. Initial field work took advantage of existing regional variation in patterns of land clearing to develop relationships between vegetation extent/configuration and both patch condition and the diversity of birds, small mammals, reptiles and selected groups of invertebrates. There was evidence from some individual species and groups to a threshold response of accelerated loss of individuals or species from landscapes with less than 40 to 60 per cent remnant vegetation. The predictive capacity of these relationships is being tested by assessing the impact of recent clearing events on landscape condition and the presence and abundance of the selected taxa. The outputs will help design new approaches to land clearing that show promise for maintaining ecosystem function and biodiversity while also meeting the production needs of landowners. These outputs are informing an adaptive management framework established by the NT Government and regional landholders to direct development in the region.

Dr Andrew Young (CSIRO) has improved understanding of the genetic and demographic constraints to persistence of plant populations in remnant vegetation patches through field studies in two environments: the mallee woodland of central-west NSW and the kwongan heathlands and shrublands of south-west WA. The project has produced the first dataset of its kind looking in detail at patterns of genetic variation, fitness and direct observation of interpopulation gene flow in response to habitat fragmentation across large (200–400 square kilometres) landscapes in Australian biomes. Fragmented populations of plant species with highly mobile pollinators, such as *Eremophila glabra* and *Banksia sphaerocarpa*, appear able to maintain significant reproductive function but inter-population reproductive dynamics are critical to this maintenance of this function. For example, 26 to 62 per cent of all genotyped *E. glabra* seed and 15 to 33 per cent of *B. sphaerocarpa* seed resulted from interpopulation reproductive events. In *E. glabra* these events could be shown to be regularly taking place over scales of 5–10 kilometres. Therefore, fragmented plant species must be managed for conservation at scales well beyond the individual population.

Dr Teresa Eyre (Qld Environmental Protection Agency) has quantified the role of regrowth vegetation in maintaining biodiversity values, soil condition, and ecological processes of landscapes in the mulga woodlands of western Queensland. In these landscapes regrowth may provide a cost-effective solution to targeted revegetation, but information on the functionality of different ages and areas of regrowth has been lacking. The study has significantly increased the ecological knowledge base on 274 species (16 amphibian, 60 reptile, 34 mammal and 164 bird species) across the eastern mulga lands. These data provide an important baseline for future monitoring of species. Species diversity, per se, was not an informative indicator in these landscapes. Some species (eg yellow-throated miners) are actively excluding other species (eg small passerine bird species). Floristic

composition in remnant and regrowth sites did differ, but the combination of biogeography, rainfall and historic grazing management appeared to be more important drivers. Regrowth mulga did not appear to contribute greatly to the functionality of the landscape from either biodiversity or productive perspectives. From both of these perspectives, lopping of mulga for fodder appears to be a low-impact management technique. The results are informing policy, planning and management of these ecosystems.

Competitive tenders are an important mechanism for allocating limited amounts of funding to landholders as payments for particular ecosystem services, such as biodiversity conservation. Dr Andrew Reeson (CSIRO) improved the capacity of such auction mechanisms to explicitly consider the spatial configuration of conservation actions, and their interactions, which is essential for achieving complex landscape objectives such as biodiversity corridors. The project developed an iterative auction process and also produced a software package that simulates the auction environment for hands-on learning in a workshop environment. The principal investigator was on an expert panel for developing the *National Capacity Building Program for use of Market Based Instruments*, so the project's outputs have had a direct way of influencing those involved in implementing competitive tenders.

A systematic review (in collaboration with CSIRO Sustainable Ecosystems and the *Knowledge for Regional NRM Program*) addressed the question: Does structural connectivity facilitate dispersal of native species in Australia's fragmented terrestrial landscapes? The review found good evidence that elements of structural connectivity provide habitat for many species. A number of studies also found that the presence of structural connectivity increased the rates and/or likelihood of movement of many species. All forms of structural connectivity appeared effective to some degree in both providing habitat and in facilitating movement. The exploratory analyses suggest that, for providing habitat, continuous corridors were better than discontinuous linear elements, which were better than stepping stones (eg scattered paddock trees). However, in terms of facilitating movement, the analyses suggest that stepping stones are at least as good if not better than continuous corridors. Species that are habitat specialists or that disperse terrestrially were less likely to be found living in structural elements between patches. Corridors were less likely to be used as habitat by tropical species and by reptiles. There was insufficient data to infer the influence of width or other factors on effectiveness of the different forms of structural connectivity at facilitating movement.

Management regimes for native vegetation

Dr Mike Clarke (La Trobe University) is identifying fire mosaics that improve persistence and status of flora and fauna in the Eucalypt mallee habitats of the semi-arid Murray Mallee region of south-eastern Australia. While there is consensus that conservation of mallee habitats is best achieved by managing landscapes to maintain 'fire mosaics', there is little knowledge of which mosaics are best. The project is studying responses of a broad range of taxonomic groups to various fire regimes at sites across three States (VIC, SA, NSW). A GIS modelling tool is incorporating project findings for the benefit

of future fire planning by land management agencies in each state. Preliminary results were presented for feedback and discussion at *Mallee Fire and Biodiversity Project* Workshops held in Mildura and Melbourne at the end of 2008. These workshops were well attended by land managers, public land administrators, other researchers, and NGOs involved in vegetation management.

Dr Anita Smyth (CSIRO) is helping define the desired outcomes for landscape condition from waterpoint management in arid rangelands from field studies on cattle properties in the stony plains country of South Australia. Here, a permit system for waterpoints trades off livestock grazing and biodiversity conservation. The project has revealed the importance of gilgai vegetation in arid South Australian stony deserts for conserving a range of ephemeral wetland plant species. The initial findings with respect to grazing relaxation—little impact on flora but a likely impact on fauna —represent the first rigorous assessment of relaxation of grazing pressure, through closure of water points, in the rangelands. The relative lack of grazing impact appears to have been associated with the widespread distribution of gilgais throughout this landscape—when rains arrive, stock grazing is spread across the landscape and the mainly ephemeral plant species have the opportunity to grow and reproduce. The project's results are likely to have major impacts on future SA policies, and those of other jurisdictions, related to management of stock water points in the rangelands.

Dr John Woinarski (Tropical Savannas CRC) has improved our ecological understanding of the tropical open forests and woodlands of northern Australia, one of the world's most extensive intact forest systems but one which is increasingly a target for broad-scale vegetation clearance. The project described the biodiversity values of 'mature' eucalypt forests, with specific reference to hollow formation and other attributes that may be useful in definition of 'old-growth', and measured the relationship between biodiversity value and age of regrowth. Most faunal species typical of intact forests occurred in regrowth after about 20 years. However, there were some important exceptions, especially hollow-dependent species, that were unlikely to occur in regrowth until adequate numbers (or sizes) of hollows were available. Large hollows are unlikely to be present until regrowth is at least 60 to 75-years-old while, in intact forests, large hollows were only associated with trees likely to be at least 220–500 years of age; the latter trees are a relatively rare resource. 'Old-growth' is therefore a potentially useful categorisation for these forests—currently, the development stage of these forests (ie whether 'old-growth' or not) is not considered in assessing clearing applications. The project's outputs are informing policy, regulations and guidelines related to clearing in the Northern Territory.

Dr Martine Maron (University of Southern Queensland) has improved understanding of the effects of management and vegetation structure on woodland birds in the Brigalow Belt of central Queensland, a national biodiversity hotspot. The research showed that habitat quality for small passerine species within intact woodlands is highly variable and that reducing the complexity and density of vegetation through regular burning regimes (a common practice on reserves in the area), in combination with feral grazing, produced a habitat structure highly suitable for the invasive species, the noisy miner. The knowledge was used to

develop a decision tool that reliably predicts the outcomes of different management scenarios, which will be of great assistance for guiding management of conservation areas and surrounding grazing properties. The project work is continuing as a PhD study.

A systematic review (in collaboration with CSIRO Sustainable Ecosystems and the *Knowledge for Regional NRM Program*) addressed the question: Do managed grazed lands contribute to conservation of plant diversity in Australian temperate grassy eucalypt woodland? The review found that the dominant native species in grazed native pasture differ from reference grasslands and that many native plant species decline in abundance as a result of livestock grazing. However, grazed native pasture do support native perennial species and so do contribute to conservation of native plant diversity. Fertilised pastures, on the other hand, appear to contribute little to conservation of native plant diversity in these landscapes. In addition, exclosure of native pasture (a commonly-promoted practice) does not consistently result in increased abundance or frequency of native species. It was clear that the effect of livestock or fertilisation on vegetation differs from relief from these practices—the nature of the disturbance and restoration transitions differ.

Adoption and application of knowledge

Dr Stuart Cowell (Bush Heritage Australia) has developed a formal performance recording system, *Increment*, for evaluating and documenting the biodiversity benefits resulting from investments in land acquisition and/or on-ground management actions. There is growing investment in the private conservation sector in Australia and, as with public investment in conservation management, there are variable approaches to both assessing the relative potential value of different investments and evaluating and reporting the actual outcomes. The project has produced *A guide to designing and implementing performance reporting to increase the confidence of conservation investors*. Core elements of this guide are already in place within Bush Heritage, and are being regularly used as part of the organisation's reporting to investors and stakeholders. All the knowledge assets from the project are available online (www.bushheritage.org.au/increment).

Mr Rowan Reid (University of Melbourne) has worked with farmer groups in selected regions to exchange information, experience and ideas for better integration of native vegetation management into overall property management. Mr Reid has modelled his approach on the successful *Australian Master TreeGrower* (MTG) Program which has mainly focused, to date, on integration of commercial tree production into farm systems. LWA support has contributed to the conduct of 21 MTG workshops involving over 400 participants. The project found that the MTG model of farmer engagement can be an effective way of promoting broader natural resource management outcomes, including retention and management of native vegetation.

A study (Lovett Clarke Consulting Pty Ltd) was commissioned, in collaboration with Greening Australia and North Central CMA, to evaluate the extent of awareness, understanding and application of landscape restoration science, particularly it application to managing native vegetation and biodiversity. The study found that the main restoration approaches used by regional Natural Resource Management groups include focal species, thresholds, improving vegetation condition, maintaining

or enhancing structural and floristic diversity, and establishing connectivity/corridors in the intensive land-use zone. The effectiveness of these approaches once implemented was largely untested. The concept of ecosystem services is being increasingly adopted, but there is limited quantitative information available relevant to regional decision making. Emerging trends are the increasing number of large-scale 'biolink' style projects, which appear to have a limited scientific basis at the moment. Constraints to more informed application of science included: experts not being accessible; a lack of agreed 'logic' for selecting the best approach for each situation; lack of integrated information to access; and on-ground staff being time poor and often needing to achieve on-ground outcomes in short, unrealistic project time-frames.

Events and activities

- *Australian Master TreeGrower workshop,* 31 March–1 April 2009, Deans Marsh, Victoria

  LWA has been a co-investor in the *Master TreeGrower* program through both the *Joint Venture Agroforestry* program and the *Native Vegetation* program.

- *Veg Futures 08,* 20–23 October 2008, Toowoomba

  LWA co-convened a successful conference with nearly 400 delegates from a range of NGOs, government and research agencies, and community groups.

- *Annual program meeting*, 27–28 August 2008, Brisbane

  the annual program meeting with researchers, PMC members and invited policy advisers received much positive feedback

- *Science in the Paddock,* 17 June 2009

  a final breakfast briefing session held in partnership with Greening Australia and JVAP which focused on presentations by Mr Rowan Reid (University of Melbourne) about the *Master TreeGrower* program, Mr Andrew Stewart (farmer) about the *Otways Agroforestry Network*, and Mr Alex Campbell launching a book of highlights from the fifteen years of JVAP research and a prospectus about future R&D investment in 'woody crops'.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Engagement with key audiences with knowledge of the role and value of native vegetation and biodiversity and improved management regimes	◗ Workshops, meetings and publications to support dissemination of project knowledge into practice ◗ *Veg Futures 08* conference successfully held ◗ All finalising projects produce scientific papers in appropriate academic journals ◗ Final projects produce information for policy advisors, regional NRM bodies and land managers ◗ At least two editions of *Thinking Bush* produced. ◗ Information on science and practice of approaches to restoring landscapes disseminated	◗ Annual program meeting with researchers, PMC members and invited policy advisers ◗ 8 new fact sheets ◗ 2 editions of *Thinking Bush* plus an additional edition in press ◗ Successful *Veg Futures 08* conference with nearly 400 delegates ◗ 6 final reports, with each in the process of having major impacts on policy and practice ◗ More than 15 new peer-reviewed journal papers ◗ 3 K&A projects completed ◗ Monitoring and evaluation process underway

Tropical Rivers and Coastal Knowledge Program (TRaCK)

The aim of the *Tropical Rivers and Coastal Knowledge Program* (TRaCK) is to provide the science and knowledge that governments, communities and industries need to make better decisions for the sustainable use and management of Australia's tropical rivers, estuaries and coasts. TRaCK has brought together a multidisciplinary consortium of partners to focus on the rivers and estuaries between the tip of Cape York Peninsula and Broome.

Established in 2007, all projects within the program are well advanced, with a number having already delivered final reports. With more than 70 of Australia's leading social, cultural, environmental and economic researchers involved in the program it is delivering the information that managers need to make sound decisions about the management of rivers in northern Australia. Further information can be found at www.track.gov.au.

At 30 June 2009 negotiations were underway with a view to transferring management of TRaCK to another agency.

Executive Manager

Mr Jim Donaldson

Partners

- The Australian Government through the *Commonwealth Environment Research Facilities Program*
- The National Water Commission's *Raising National Water Standards Program*
- The Queensland Government's *SmartState Program*
- Research institutions and state and territory governments which form the TRaCK consortium; they include Charles Darwin University, the University of Western Australia, Griffith University, CSIRO and the North Australia Indigenous Land and Sea Management Alliance.

Program duration

2006–07 to 2010–11

Expected program outcomes

- Increased understanding of the important natural assets and ecosystem services provided by tropical rivers and coasts.
- Developed methods and tools to assess the implications of potential developments.
- Identified opportunities to develop genuinely sustainable enterprises.
- Enhanced capacity and knowledge of the community to engage in management planning processes.

Total expenditure budget for the program

The program is funded by $18 million provided by the research institutions, partners and state and territory governments that form the TRaCK consortium, more than $16 million of which is provided by the partners to Land & Water Australia, comprising contributions from Land & Water Australia ($3 million), the *Commonwealth Environment Research Facilities Program* ($8 million) and the *Raising National Water Standards Program* ($5 million). $2 million is being provided by the Queensland Government's *SmartState Program* for research managed through Griffith University.

Expenditure for 2008–09

$5.731 million (LWA $0.720 million)

Program highlights

Theme 1 Scenario evaluation

Project 1.1 integrates research from other themes and provides tools for evidence-based decision making. Dr Francis Pantus was engaged as a consultant to develop a plan for implementing the recommendations of the review of Project 1.1. He gave an update on developing the plan at the December 2008 Research Executive Committee (REC) meeting. The REC was very pleased with progress and was supportive of the proposed approach for revising the project. Since that meeting, Dr Pantus has accepted a position at Griffith University and from mid-May 2009 he will work for 70 per cent of his time on leading Project 1.1.

Further meetings have been held with the project team, stakeholders and REC members and a draft strategic plan has been circulated internally for comment before submission to the Project Management Committee (PMC). Data collection for the inventory of integration activities (undertaken by Drs Neil Collier and Colette Thomas) has now been completed and is being analysed. This will make an important contribution to the revised project and will provide a strengthening of integration across TRaCK.

Project 1.2 is developing visioning and scenario tools that strengthen local capacity. It still has a number of milestones that have not yet been met although the review of the project has now been completed. The review highlighted some significant issues with the project. The project team are preparing their response to the review and this will be used by the REC to make recommendations to the PMC. The project has continued to engage with the Daly River Aboriginal Reference Group although future governance training is awaiting the outcomes of discussions by the PMC on TRaCK's role in such activities.

Project 1.3 is promoting collaborative approaches to water planning. A retrospective analysis of water planning has been completed and five reports on this work have been published. The prospective case

studies have been delayed by changes in the planning process in both Qld and the NT. These issues have been resolved in Qld and the case study work has now commenced. The Qld case study has also developed good links with members of the North Australia Indigenous Land and Sea Management Alliance (NAILSMA) Indigenous Water Policy Group, which should strengthen the project. In the NT, a new committee has finally been formed to oversee water planning in the Darwin region. The new committee remains enthusiastic in its support of this project and the trialling of new collaborative approaches has now commenced.

Theme 2 Values and assets

There are two projects within this theme: *2.1 Valuing tropical rivers* and *2.2 Indigenous socio-economic values and river flows*. Both projects are well placed to deliver useful outputs, although some delays have been experienced in data collection affecting the timing of deliverables.

Project 2.1 is assessing the values to society of the ecosystem services provided by tropical rivers.

The economic valuation instrument (choice modelling questionnaires) has been delivered and the response rate was excellent. There was a generally positive response to the questionnaire among the Indigenous population surveyed. The data is currently being analysed. A wide range of literature has been reviewed and data collected for two of the three catchments and a first draft of a paper describing the conceptual framework has been prepared for the historical and systems analyses of value.

Project 2.2 is recording Indigenous socio-cultural knowledge relating to water and quantifying the economic benefit to Indigenous people from water-dependent resource use in two focal catchments. This project has shown good progress given the delays experienced in executing permits and agreements with Aboriginal Land Councils. As advised previously, the delays have affected the completion of some deliverables. These delays will affect the project's timeline for completion. Good progress has been made on the socio-economic survey (both catchments), yielding interesting preliminary results. Similarly, the social values component in the Daly River is well underway with some exciting Indigenous knowledge products in development. Communication activities have generated positive interest.

Theme 3 Riverscape and coastal settings

Project 3.1 will provide socio-economic background and population projections for each river catchment within the Tropical Rivers region. Data collected to date has allowed for 39 population profiles to be completed (covering all TRaCK basins), and this includes a profile for the TRaCK region as a whole and one for the balance of Australia for comparative purposes. In addition researchers have made an exploratory, qualitative comparison of the demographic profiles, seeking to develop typologies of regions within the broader TRaCK region.

Work on the socio-economic profiling was finalised in March 2009. So far, researchers have completed a variable-by-variable analysis, using GIS to produce maps which show the way in which key socio-economic characteristics vary across the entire TRaCK region (eg computer use or average household size in each catchment). Researchers are currently compiling this information to produce a series of profiles

which summarise a variety of socio-economic variables for individual TRaCK catchments.

Project 3.2 is developing a tool to describe similarities and differences in riverscapes across the tropical region at three spatial scales. The project is progressing well. In the previous milestone report concerns were raised about the availability of some key datasets (such as the 1 sec Digital Elevation Model and a consistent geology dataset at a useful resolution across the whole of northern Australia). The delays in the supply of some of these datasets has caused the project to take a new path where it has developed something far superior to what was originally conceptualised. The project decided to focus its efforts on the development of a universal classification tool, which could then be updated with better data as it became available. The first draft of the classification at each resolution is almost complete which involves the geo-landscape provinces (tier 1) classification of the entire geographical region of TRaCK (Gulf of Carpentaria and Timor Sea Drainage Divisions). A number of questions were raised at the last PMC meeting; these have been addressed under issues of concern in the project report.

Project 3.3 was initiated prior to most other projects in the TRaCK program and is complete. It provided an ecohydrological classification of Australia's (not just northern Australia) rivers based on streamflow data. The project outputs will be useful for the assessment of flow regimes in ungauged or poorly-gauged catchments and the formulation of flow rules in environmental flow studies; it will facilitate the examination of the spatial arrangement of biodiversity of aquatic organisms and ecological traits; provide an additional layer in studies of riverine landscapes and channel evolution and of studies of waterhole persistence and food web variation; and also provide a mechanism for assessing the impacts of future climate change. Work is underway to generate additional communications products from the project.

Theme 4 Material budgets

Project 4.1 is examining groundwater and surface water budgets, and the interaction between groundwater and surface water in the Daly, Fitzroy and Mitchell catchments.

A draft report of field work undertaken in the Fitzroy River catchment was completed and distributed to relevant parties. Conceptual surface water-groundwater modelling has focused on simulation of interactions through bank storage under sloping river bank conditions, and this work has almost been completed.

For the Daly River, evapotranspiration and soil moisture data continue to be collected, with significant progress made over the past six months. Data on surface runoff was identified as a gap in the program, and so funds have been obtained elsewhere to set up a small flume in the vicinity of one of the flux towers to address this. Pressure sensors have also been installed in Stray Creek to monitor wet season flows. This will provide additional data that will lead to a more accurate water balance for the region. Rainfall runoff-simulations cannot be completed until data for the 2008–09 wet season is complete, and the soil moisture modelling is complete. This work is expected to commence before the next milestone report.

Project 4.2 is developing sediment budgets to predict suspended and bedload sediments, and nutrient (nitrogen and phosphorus) sources, loads, and storage, and these

outcomes will be mapped to provide whole-of-catchment overviews of suspended sediment and nutrient sources. Analysis of samples taken from the Daly and Mitchell Rivers is continuing. At this stage sufficient data only exists to report on erosion process sources in the Daly River, analysis of Mitchell River samples is expected to be complete by the end of March 2009, and continued development of the sediment and nutrient budget modelling will occur in the second half of 2009 when more field data are available.

Project 4.3 is investigating the transport and fate of introduced sediments and nutrients and how their concentrations and fluxes impact on the form and rate of primary production in river systems. The project has produced an initial report on sediment and nutrients in the Daly River and has completed reports on field sampling undertaken over the past 12 months.

Project 4.4 is developing an understanding of bedload transport rates and sources in two large northern Australian tropical rivers—the Mitchell and Daly Rivers. Hydrodynamic modelling and the analysis of bed material availability from Mitchell River gullies is well advanced, while the analysis of samples is delayed.

Theme 5 Foodwebs and biodiversity

A paper on top-down control on algal biomass and productivity in the Daly River has been drafted (*Project 5.1*). Sample collection for food web analysis has been undertaken in the Fitzroy, Daly and Mitchell rivers and samples are currently being processed. The decision not to undertake a major nitrogen-isotope labelling study in the Daly is well justified and we are confident that these questions of aquatic-terrestrial subsidies can be answered with natural abundance isotope data instead.

Remote sensing of waterhole distribution and field validation of measures of turbidity and chlorophyll are well underway, especially in the Mitchell (*Project 5.2*). Waterholes can be easily delineated by remote sensing and patterns of connectivity during past flow events have been mapped. Samples for water isotopes and ion chemistry, and food web analysis have been collected from all three catchments and are currently being processed. A network of water sensors has been installed in waterholes in the Mitchell to help validate patterns of connectivity and persistence. Work will commence in the Flinders River this coming dry season.

After a false start because of the extensive flooding, the first major field investigation of the Mitchell floodplain was completed in March and good collections of water chemistry and biota were taken (*Project 5.3*). Transects of water sensors installed during the dry season will help validate remote sensing of extent and duration of flooding. A synthesis paper of ecosystem research on floodplains in the Alligator Rivers region has been drafted.

Final reports on the effects of urbanisation in Darwin Harbour have been completed, identifying sources of sediment and the impacts of point source discharge of sewage. An additional report on Buffalo Creek (*Project 5.4b*) indicated a significant effect of sewage on water quality and ecosystem health. Field research in the southern Gulf is well underway with staff stationed in Karumba during the late dry season and throughout the wet. Surveys of water quality and biota in the Norman River were undertaken in the wet.

Excellent progress has been made in the analysis of samples of fish otoliths in the Gulf catchments and significant relationships between flow and fish recruitment identified (*Project 5.6*). The publication issue identified in the previous *Theme 5* report has been resolved.

A report on the flow-ecology workshop held at Charles Darwin University in April 2008 has been finalised and outlines a proposed approach for synthesis activities in *Project 5.7*. As a result of the review of *Theme 1* activities, we aim to embed this activity in the broader scenario development.

Good progress has been made with the bioregionalisation work based on fish species distributions and this is being used to develop conservation priorities for the region (*Project 5.8*). Molecular analysis of several species of fish across the north has revealed strong patterns of differentiation between regions.

Theme 6 Sustainable enterprises

Recent progress with the case studies includes the completion of a contract for the Maningrida cast study which is with The Australian National University for signature. A new coordinator has been identified to commence work in April 2009. Project proposals for WA and Qld are completed. Potential project areas have been identified and consortium members invited to participate. The aim is for arrangements to be agreed for Fitzroy (WA) and Archer River (Qld) during April.

A new process was followed for framing WA and Qld case studies. Indigenous stakeholders specified areas of research interest and TRaCK consortium members were invited to develop projects with them. A number of expressions of interest have been received in regard to WA and details of the Qld opportunity have recently been distributed.

The approach for developing the case studies raises options for existing projects to extend their work to new sites and to link studies directly to interests and aspirations of Indigenous stakeholders. Although not yet finalised, initial expressions of interest from consortium members indicate potential for linkages of case studies to a number of existing projects, and joint development of project proposals will foster further interaction with Indigenous organisations.

New knowledge

New knowledge from the TRaCK program was published in a number of reports including: four background reports on collaborative water planning to improve community participation in water planning and to develop tools for better community engagement; a project report describing a tool that classifies northern Australian rivers on the basis of their flow regimes and ecology; a report that mapped and assessed the impact of alluvial gully erosion in four tropical savannah rivers; a report on water-use scenarios for the Howard River, NT; and a report on the results of examining water quality decline in the Buffalo Creek, Darwin Harbour. Publications are listed in Appendix 3.

Events and activities

- *TRaCK research consortium workshop,* 21–23 April 2009, Brisbane
- River*Symposium,* planned for September 2009
  - planning to run a session with four presentations to showcase outputs
- *Briefings with key agencies*, May 2009, Canberra

included the National Water Commission, DEWHA, ministerial advisors and the Fisheries Research & Development Corporation.

- *On TRaCK*, August 2008
  first issue of TRaCK's flagship publication; a second edition is being prepared for publication.
- *Fact sheets for all TRaCK projects*
  have been completed, loaded on the website and hard copies distributed to project leaders and some key regional organisations.
- *Intranet site*
  all consortium members including students and the PMC now have access (over 110 people in total).

Key Performance Indicators	2008–09 Targets	Achievement against targets
Stakeholders effectively engaged in scenario evaluations and project planning	◗ Advisory group meetings for scenario evaluation held ◗ Tools that help evidence-based decision making, including stakeholder-driven models that explore scenario consequences ◗ Draft scenario models for Daly and Fitzroy River catchments complete ◗ Initial reports and policy briefs on 'Visions for the North'	◗ Advisory group meeting held on 21 April 2008. ◗ Daly River Stella Model partially complete but requires data from other projects. ◗ Fitzroy River model progress reported in March 2009. ◗ Visions for the future document produced and provided to Daly River Management Advisory Committee (DRMAC) for comment. ◗ Document titled *Indigenous perspectives on visions for the Daly* completed and used to frame submission by the Aboriginal Reference Group to the Northern Australia Land & Water Task Force.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Publication in peer-reviewed media, newsletters and other products.	◗ Final report on planning tools produced, including identifying barriers and opportunities for industry, Indigenous and broader community participation in water planning ◗ Project and catchment fact sheets prepared ◗ Growth in number of academic journal articles	◗ Development of planning tools delayed by six months as a result of limited capacity and competing priorities in state government. Final report to be delivered in December 2009. ◗ Project fact sheets completed for all projects. ◗ Need to consolidate data on peer-reviewed journals.
Projects assessed as having an impact on government and community planning processes.	◗ Catchment management meetings held in each focus region ◗ Governments engaged in water planning projects in NT, Qld and WA ◗ Presentations at public conferences and workshops	◗ Catchment management meetings held with the Daly River Management Advisory Committee, NT; Fitzroy catchment groups, WA; Northern Gulf Resource Management Group, Qld; and Mitchell Indigenous Forum, Qld. ◗ Meetings held with NT, Qld and WA Government agencies to implement water planning projects. ◗ Presentations given at *Coast 2 Coast Conference; Riversymposium 2008; Commonwealth Environment Research Facilities Program (CERF) National Workshop.*

Legacy activity

The following two programs formally ceased at the end of the 2007–08 financial year. However, some legacy activity arose from Land & Water Australia continuing to manage the knowledge generated by the programs, with the aim of maximising adoption and outcomes from these research investments.

Grain & Graze Program

The *Grain & Graze* program aimed to boost farm profitability across the mixed farming zone of southern Australia, while helping to protect the environment. It worked in nine mixed-farming regions across Australia and aimed to influence changes in practice on 6,800 mixed farms. The final year of the program was 2007–08, however during 2008–09 there was some legacy activity in the form of concluding projects and knowledge and adoption continuing.

Grain & Graze ran for five years from 2003 to 2008. It invested in research, development and extension to improve the profitability and sustainability of mixed farms, focusing on cropping, pastures, livestock, profitability, whole-farm economics, farming systems, social issues and natural resources including soil, water and biodiversity. There was direct involvement of farmers in local trials, development and extension activities and links were developed with NRM bodies. More than 4,000 producers were involved in hands-on engagement. There was an average nine per cent increase in profit for the 2,000 farmers who adopted the practices advocated by *Grain & Graze* or ceased practices the research had found not to be beneficial.

Grain & Graze partnership developed in response to recognition of the need for collaboration to effectively take a holistic approach to farming systems and natural resource management issues on mixed farms. Further information can be found at grainandgraze.com.au.

Executive Manager

Ms Anwen Lovett

Partners

- Grains Research & Development Corporation
- Australian Wool Innovation Limited
- Meat & Livestock Australia Limited

Program duration

2003–04 to 2008–09

Expected program outcomes

Grain & Graze had three targets:

- a 10 per cent increase in mixed farm profitability, driven by a five per cent increase in grain yields and a 10 per cent increase in livestock production
- improved condition of natural resources on mixed farms in line with regional or catchment targets
- confident and knowledgeable mixed farmers making decisions and using tools that sustain production and promote biodiversity.

Total expenditure budget for the program

$14.43 million

Expenditure for 2008–09

$0.426 million (All partner funding)

Program highlights

There were no new highlights in 2008–09 as the program was substantially completed.

New knowledge

- Final Report from the *Grain & Graze* Avon regional initiative project
- Final Report from the *Grain & Graze* Murrumbidgee regional initiative project
- Final Report from the *Grain & Graze* Northern Agricultural Region regional initiative project
- Final Report from the *Grain & Graze* Border Rivers regional initiative project
- Final Report from the *Grain & Graze* Corangamite Glenelg-Hopkins regional initiative project.

Events and activities

- There were no *Grain & Graze* events in 2008–09 as the program was substantially completed.
- A *Grain & Graze* Special Edition of the *Australian Journal of Experimental Agriculture* will be published in August 2009.

Key Performance Indicators	2008–09 Targets	Achievement against targets
All Grain & Graze projects completed	Final reports submitted and approved	Project Final Reports were submitted and approved.

Healthy Soils for Sustainable Farms Program

Healthy Soils for Sustainable Farms aimed to establish, promote and implement the links between soil health, rainfall management, agricultural production and water catchment management. Further information can be found at lwa.gov.au.

The program was substantially completed in 2007–08 and a Final Report was published. During 2008–09 there were a small number of ongoing projects relating to funding from the Grains Research & Development Corporation, and further completion of the *Soil Health Knowledge Bank*.

The *Healthy Soils for Sustainable Farms Program* was an Australian Government initiative funded through the Department of Agriculture, Fisheries and Forestry and the Department of the Environment, Water, Heritage and the Arts. The Grains Research & Development Corporation was a major co-funder and the program was managed by Land & Water Australia. *Healthy Soils for Sustainable Farms* ran from 2005–06 to 2008–09 and its prime purpose was to get: 'more farmers moving to practices that maintain and restore our soils; which will, in turn, contribute to healthy catchments and sustainable agricultural enterprises'. The program's work was informed by market analysis.

The *Healthy Soils for Sustainable Farms Program* achieved a substantial rise in awareness about the importance of soil health among farmers, advisors, extension and NRM staff. More than 30,000 people received information about the program and its results and 17,000 participated in workshops, field days and soil assessment training.

The *Soil Health Knowledge Bank* (soilhealthknowledge.com.au), which consolidates current knowledge and experience in managing healthy soils, is an important output from the program and was launched on 22 June 2009. Opportunities for transfer of management of the *Soil Health Knowledge Bank* to secure its legacy following the closure of LWA were underway at the end of 2008–09.

Executive Manager

Ms Anwen Lovett

Partners

- Australian Government Department of Agriculture Fisheries and Forestry
- Grains Research & Development Corporation

Program duration

2005–06 to 2008–09

Expected program outcomes

More farmers moving to 'practices which maintain and restore our soils' which will, in turn, contribute to healthy catchments and sustainable agricultural enterprises'. There will also be a replenishment of Australia's expertise in soils—which has been challenged by under-investment in the area over the past decade or so.

Total expenditure budget for the program

$6.200 million

Expenditure for 2008–09

$0.424 million (LWA $0.025 million)

Program highlights

Key highlights from the program during 2008–09 include:

- Launch of the *Soil Health Knowledge Bank* (soilhealthknowledge.com.au). This resource consolidates current knowledge and experience in managing healthy soils into one easy-to-access website. It provides clear and consistent information about the attributes of healthy soils, and the management practices farmers need to use to sustain biological functioning, maintain environmental quality and promote plant and animal health. The six characteristics of healthy soils and ten habits of healthy soils farmers are key messages developed through the *Healthy Soils for Sustainable Farms Program*.

New knowledge

- 2008–09 was a legacy year of the program and so there was no new knowledge generated. The ongoing GRDC projects were focused on extension of current knowledge.

Events and activities

- Launch of the *Soil Health Knowledge Bank*, 22 June 2009.

- *Soil health workshop materials*
  from Queensland Department of Primary Industries project: *Sustainable soil health management workshops for northern broadacre cropping industries*.

  from University of Western Australia and Department of Western Australia project: *Improving soil health in Western Australian farming systems*.

  from Victorian Department of Primary Industries project: *Soil health: Legacy for SE Australia*.
- *Soil Health in Central Queensland* results booklet.
- 19 fact sheets
  covering soil health topics from University of Western Australia and Department of Western Australia project: *Improving soil health in Western Australian farming systems*.
- *Quick reference guides on soil tests*
  five from Victorian Department of Primary Industries project: *Soil health: Legacy for SE Australia*.
- *Practical notes on soil properties*
  four from Victorian Department of Primary Industries project: *Soil health: Legacy for SE Australia*.
- *Soil Health: Leaving a legacy for south-eastern Australia*
  demonstration site report.

Key Performance Indicators	2008–09 Targets	Achievement against targets
A *Knowledge Bank* which is the one stop shop for soil health information and training resources	*Knowledge Bank* live on website	*Knowledge Bank* completed and website launched to the public on 22 June 2009
All project funded by the program completed	Final reports submitted and approved	All original projects completed and final reports submitted and approved. Two small follow-on projects due to complete early in 2009–10.

2.8.3 Strategy 2: Collaboration and strategic analysis

Strategy 2 sought partnerships with government, industry and research bodies to provide efficient research and its adoption.

Collaboration and strategic analysis

Land & Water Australia's collaborations brought together researchers and stakeholders from across Australia to reach consensus on research priorities and desired outcomes. Collaborative efforts can involve rural industries, other funding bodies, government agencies and community-based groups. Partnerships such as this make research investments more efficient and bolster the research effort by reducing duplication, maximising investment and providing a greater platform for adoption.

Executive Director

Dr Michael Robinson

Partners

Across its portfolio, Land & Water Australia had 64 co-investing program partners and many more partners at the project level.

Program duration

This was a continuing program under the *2005–2010 Strategic R&D Plan*.

Expected program outcomes

Researchers and stakeholders from across Australia brought together to reach consensus on research priorities and desired outcomes, influencing research directions while avoiding duplication of effort and providing a stronger platform for adoption.

Expenditure for 2008–09

$0.253 million (All LWA funding)

The expenditure budget in Strategy 2 is for return-on-investment analysis. The cost of the collaboration is borne in the corporate area.

Program highlights

During 2008–09 work was begun to scope and develop a new strategic research and development plan for the organisation prior to the announcement of cessation of funding to the organisation. Land & Water Australia had begun to discuss existing and emerging research priorities with government, industry and research stakeholders. Examples of key issues that were identified as emerging challenges for Australian primary industries in areas related to natural resource management included:

- the need for opportunistic production systems and to maintain the integrity of our resource base under a more variable climate
- managing transitions between primary industries as climate conditions change
- how to manage on-farm biodiversity under the pressures of climate change
- valuing natural resources to manage trade-offs from different uses
- re-building Australia's capacity and capabilities in soil science
- systems to better manage and value social, cultural and institutional knowledge in natural resource management decision making
- support for innovation and new ways of addressing natural resource and productivity challenges.

As part of its collaboration and strategic analysis activities, LWA was also actively involved in the *Australasian Joint Agency Scanning Network*. The network involved federal, state and New Zealand government representatives in scanning research and media articles to identify and scope emerging environmental issues and produced quarterly reports that were incorporated in strategic planning and informed Board deliberations.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Maintain and grow number and depth of partnerships	Continue leadership role in the development of the *National Climate Change Research Strategy for Primary Industries*	Leadership continued in the development of CCRSPI, to the point of negotiating a third phase in the program from the partners
Continued development of Return on Investment capacity and analysis of LWA's portfolio	Continue to lead development of Return on Investment work across the research and development corporations and analysis of LWA's portfolio of investments	Completed three new return-on-investment analyses. Continued contribution to cross-RDC return-on-investment analyses through the Council of Chairs.

Legacy activity

The following program formally ceased at the end of the 2007–08 financial year. However, some legacy activity arose from Land & Water Australia continuing to manage the knowledge generated by the program, with the aim of maximising adoption and outcomes from the research investment.

National Land and Water Resources Audit (NLWRA)

The objectives of the Audit (2002–2008) were to facilitate improved decision making on natural resource management. Core functions of the NLWRA included:

- coordination of collation of data and information as a basis to report on the natural resource management (resource condition, social and economic) indicators developed by the NRM Ministerial Council
- ensuring data and information from initial NLWRA assessments were available as a baseline for monitoring natural resource condition
- maintaining and updating the Australian Natural Resources Atlas and the Data Library as required to support the core functions, including maintaining free access to publicly-funded data and information and supervision of data coordination arrangements undertaken by DAFF, DEWHA and other agencies
- coordination and management of data coordination activities.

Further information can be found at nlwra.gov.au.

Executive Director

Blair Wood (out-posted from DAFF, completed service 2008)

Partners

The Audit was undertaken in partnership with all states and territories, CSIRO, the Australian Bureau of Statistics (ABS), and ANZLIC the Spatial Information Council. Representatives of these organisations formed the Audit Advisory Council. Land & Water Australia and the Chair of the National State of Environment Report were observers on the Council.

Program duration

The current operational program of the Audit began in 2002 and concluded on 30 June 2008. Final administrative activity occurred during 2008–09.

Program outcomes

- A web-based compilation of Resource Condition and Social Economic Indicators and associated protocols underpinning the National Monitoring & Evaluation Framework.
- Assessment reports specifically related to:
  - Rangelands (2008)—*taking the pulse*.
  - Agricultural industries—*Signposts for Australian Agriculture*.
  - Australian terrestrial biodiversity (an Assessment in 2008).
  - An assessment of the extent of significant invasive weed species.
  - An assessment of significant invasive vertebrate pest species.
- A collection of individual booklets reporting on coordination, the development of information standards and the production of information products.

Expenditure for 2008–09

$0.893 million (All partner funding)

Program highlights

There were no new highlights in 2008–09 as the program was substantially completed.

New knowledge

There was no new knowledge in 2008–09 as the program was substantially completed.

Events and activities

There were no *National Land and Water Resources Audit* events or activities in 2008–09 as the program was substantially completed.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Completion of Audit reporting	Reports finalised and documented	Complete
Data and Information Assets effectively managed	All data and information sets available on the *Australian Natural Resources Data Library* (ANRDL) and the *Australian Natural Resources Atlas* (ANR Atlas)	Complete
Audit Project Completed	Final Report by LWA as per the Contract with the Australian Government	Complete

2.8.4 Strategy 3: Knowledge into practice

Strategy 3, like Strategy 2, crosses the full portfolio of research investments and, as the name implies, addresses the need to ensure that the results of research are extended to appropriate stakeholders in a way which suits their needs.

Australian Agriculture and Natural Resources Online (AANRO)

The *Australian Agriculture and Natural Resources Online* (AANRO) is an online service integrating three databases, ARRIP (*Australian Agricultural Research in Progress*), ABOA (*Australian Bibliography of Agriculture*) and *Streamline* (the national water research database). It is being redeveloped as an online full-text digital repository of research relevant to agriculture and natural resources to assist the national management of agriculture and natural resource management. Land & Water Australia is managing the administration and redevelopment of AANRO on behalf of the program partners. AANRO is jointly funded by the Primary Industries Standing Committee, the Natural Resource Management Standing Committee, and the Rural Research and Development Corporations. Management of this program is to be transferred to the Rural Industries Research and Development Corporation. Further information can be found at www.aanro.net.

Executive Manager

Mr Bruce Wright

Partners

- Australian Egg Corporation Limited
- Australian Local Government Association
- Australian Pork Limited
- Australian Wool Innovation Ltd
- Bureau of Meteorology
- Cotton Research & Development Corporation
- CSIRO
- Dairy Australia
- Department for Environment and Heritage (South Australia)
- Department of Agriculture and Food (Western Australia)
- Department of Agriculture, Fisheries & Forestry
- Department of Environment & Climate Change (NSW)
- Department of Environment & Conservation (Western Australia)
- Department of the Environment, Water, Heritage and the Arts
- Department of Fisheries (Western Australia)
- Department of Infrastructure, Energy and Resources (Tasmania)
- Department of Natural Resources & Water (Queensland)
- Department of Natural Resources, Environment, The Arts and Sport (Northern Territory)
- Department of Primary Industries (Victoria)
- Department of Primary Industries, Parks, Water & Environment (Tasmania)
- Department of Primary Industries and Fisheries (Queensland)
- Department of Regional Development, Primary Industry, Fisheries and Resources (Northern Territory)

- Department of Sustainability & Environment (Victoria)
- Department of Territory and Municipal Services (ACT)
- Department of Water (Western Australia)
- Department of Water and Energy (NSW)
- Department of Water, Land & Biodiversity Conservation (South Australia)
- Fisheries Research & Development Corporation
- Forest and Wood Products Australia
- Forest Products Commission
- Grains Research & Development Corporation
- Grape & Wine Research & Development Corporation
- Horticulture Australia Limited
- LiveCorp Ltd
- Meat and Livestock Australia Limited
- NSW Department of Primary Industries
- Primary Industries & Resources South Australia
- Rural Industries Research & Development Corporation
- Sugar Research & Development Corporation

Program duration

2007–08 to 2009–10

Expected program outcomes

An online full-text digital repository of research relevant to agriculture and natural resources to assist the national management of agriculture and natural resource management.

Total expenditure budget for the program

$1.202 million

Expenditure for 2008–09

$0.618 million (LWA $0.008 million)

Program highlights

Key highlights from the program during 2008–09 include:

- 26 out of 29 Program Partners signed the Program Agreement.
- Contract signed with Netcat.biz Pty Ltd (Netcat) in October 2008 for the redevelopment of AANRO. Beta site for preview was released 31 July 2009. Some of the new/enhanced features include:
  - Researchers' profiles. Researchers able to add/amend their own information and upload their Research in Progress information and Project Reports/Publications to AANRO.
  - Feature publications and researchers displayed on the front page.
  - Events, news item and media releases included in the site.
  - Federated searching of AANRO website and external websites.
  - Geospatial functionality using the *Gazetteer of Australia 2006* and *Google Maps*.
- The *Climate Change Research Strategy for Primary Industries* (CCRSPI) invested in the geo-spatial functionality in the redeveloped AANRO.

Events and activities

- *AANRO Annual Forum*, 3 December 2008, Canberra
  17 Funding Program Partners and 3 Non-Funding Partners attended.
- *Information Online*, 20–22 January 2009, Sydney
  shared a vendor stall with Netcat.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Continued involvement of all partners	Contracts signed by all partners	26 out of 29 Partners have signed the Agreement. The 3 remaining Partners have been contacted to ascertain progress within their Agency of the Agreement.
Redeveloped, accessible, online database comprising a full-text digital repository of all relevant research	Contract let for redevelopment of database and redevelopment milestones met	The contract has been let with Netcat for the redevelopment. The project milestones and timelines are being met.

Knowledge and Adoption Program

Development of knowledge and adoption strategies draws early attention to research activities, stimulating discussion and exchange of information. The aim of the *Knowledge and Adoption Program* was to increase the adoption of existing and new knowledge through engagement of those who are involved in research and extension and those who have potential to adopt the results of research, including landholders, primary producers, policy-makers, natural resource managers and others. In 2008–09 efforts continued to improve access to information, sharing of knowledge, and interpretation of research at enterprise and regional levels.

Executive Manager

Mr Bruce Wright

Program duration

This was an ongoing program within the *2005–2010 Strategic R&D Plan*.

Expected program outcomes

Better informed policy making and improved practices in management of land and water resources through the uptake by policy makers and land and water managers of the findings of research funded by LWA.

Expenditure for 2008–09

$1.780 million (All LWA funding)

Program highlights

Through 2008–09 LWA implemented the findings of a review undertaken early in the 2008 calendar year to bring greater strategic focus to the management of knowledge for adoption and to align activities more strongly to the aspirations of the *2005–2010 Knowledge and Adoption Strategy*.

Corporate Communications took on publication management responsibilities to free knowledge brokers to operate more strategically and to engage more closely with stakeholders, knowledge and adoption plans were embedded from the stage of research project proposal, management of knowledge for adoption was embedded in every stage of new research contracts, and the internal skills base was broadened to facilitate communication of new knowledge through a wider variety of channels and media.

Implementation of the findings of the review facilitated organisation of a wide range of events and workshops on behalf of programs to extend knowledge to a wide range of stakeholders, as well as distribution of publications. Appointment of an additional knowledge broker also enabled substantial inroads to be made into previous backlogs in extension of knowledge from projects in the *Social and Institutional Research* and *Innovation* Programs.

Arrangements were agreed with a book publisher to ensure national distribution through bookshops of research reports published as books for wide readership, and the first publication produced under the new arrangements, *The House on the Hill—The transformation of Australia's farming communities*, was published and distributed through bookshops nationally.

Redevelopment of LWA and program websites based on a new content management system led to a 75 per cent increase in the average page views per visitor to the sites and a 235 per cent increase in average time each visitor spent on the sites.

After the Government decision that Land & Water Australia funding would cease was announced with the introduction

of the 2009–10 Commonwealth Budget, activities were focused on ensuring that all research project outcomes were brought into the public arena and to ensure continuing availability of research outcomes. Arrangements were made late in the financial year to protect the legacy of LWA research, with LWA websites to be maintained for at least two years and research outputs uploaded to *Australian Agriculture and Natural Resources Online* (AANRO).

More details of knowledge & adoption activities, outputs and outcomes are included in the reports of the research programs.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Acceptance and understanding of Knowledge and Adoption	Embedding of Knowledge and Adoption plans in all projects	Knowledge and adoption plans embedded in all new contracts and managing knowledge for adoption embedded in every phase of research projects.
Successful uptake of research results	Increasing rates of adoption of the results of research	2009 Stakeholder survey demonstrated increased awareness of LWA, most noticeably among stakeholders who had shared or used information from LWA research. It also demonstrated a significant lift in level of awareness among primary producers.

Legacy activity

The following program formally ceased at the end of the 2007–08 financial year. However, some legacy activity arose from Land & Water Australia continuing to manage the knowledge generated by the program, with the aim of maximising adoption and outcomes from the research investment.

Knowledge for Regional Natural Resource Management Program

The 56 regional NRM bodies around Australia have a significant role in investing public funds for on-ground improvement in natural resource management. The overarching objective for the *Knowledge for Regional NRM Program* was to facilitate better links between the 56 regional NRM bodies and knowledge providers, and to assist regional bodies to better manage their information and knowledge. Further information can be found at lwa.gov.au.

Executive Manager

Mr Bruce Wright

Program duration

2006–07 to 2008–09 (Phase 2)

Expected program outcomes

- Increased capacity within regional natural resource management organisations and research and development organisations to implement information and knowledge strategies.
- Authoritative resources (including a resource kit on information and knowledge management and NRM-specific search engine of relevant databases) online and being utilised by natural resource managers.
- An active Community of Practice in NRM knowledge management.

Total expenditure budget for the program

$2.900 million

Expenditure for 2008–09

$0.426 million (All partner funding)

Program highlights

Key highlights from the program during 2008–09 include:

- The South Australian government investing approximately $250,000 for all regional NRM bodies in South Australia to undertake the Knowledge Strategy process developed in package 1 of the *Knowledge for Regional NRM Program*.
- Burnett Mary NRM region in Queensland completing its knowledge strategy process.
- NRM South in Tasmania starting the Knowledge Strategy process and scheduled to be completed in August 2009.
- *Knowledge for Regional NRM Program* winning the Platinum level actKM national knowledge management award in October 2008 for delivering an outstanding cultural and technological knowledge management program that has made significant achievements in organisational capability, performance and sustainability through the application of knowledge-based projects or activities.
- Development of Australia's first agriculture and NRM thesaurus which includes Australian specific and Indigenous terminology.

New knowledge

- Development of an Australian Agriculture and NRM Thesaurus to be used in the NRM Navigator and AANRO—available to all Australian database developers free of charge.
- Knowledge for Regional NRM—achievements and options, April 2009—final report of the program.
- *Does structural connectivity facilitate effective dispersal of native species in Australia's fragmented terrestrial landscapes*—first systematic review report—co-investment with CSIRO.

Events and activities

Presentations at the following events:

- *Implementing information and knowledge strategies for whole of government outcomes: case study of the Knowledge for Regional NRM Program.* Tasmanian Government Better Practice Group, April 2009—around 80 attendees from across the Tasmanian government.
- *Implementing information and knowledge strategies for whole of government outcomes: case study of the Knowledge for Regional NRM Program.* Policy Development Officers conference, March 2009, Canberra—around 60 attendees from both public sector and private sector policy areas.
- *Knowledge for Regional NRM and AANRO—a case study,* National Policy Officers Conference, May 2009, Canberra—around 60 attendees from the research sector, Australian Government, State and Territory, and Local Government sectors.
- *Knowledge for Regional NRM : achievements and options*—final publication May 2009.

Key products and services

Package 1 *Regional Knowledge Resource Kit* (RKRK): rkrk.net.au is a wiki website providing an interactive online resource for learning and developing skills in information and knowledge management for regional NRM.

Package 2 *NRM Navigator* available at nrmnavigator.net.au is an Australian first featuring an NRM-specific search engine, and providing access to NRM-specific databases of professional bodies, events, e-networks and more. Other products include *Evidence Base* software free to all NRM organisations.

Package 3 Knowledge brokering services for regions including the *Gotta question?* service; a free service providing decision-support advice to regional bodies; a Systematic Review trial; and setting up a Community of Practice for Regional NRM Knowledge Brokers.

Key Performance Indicators	2008–09 Targets	Achievement against targets
Better Practice in Knowledge Management (KM)	Knowledge strategy training with a completed Regional Knowledge Resource Kit to be used by those trained regional NRM staff to deliver an information and knowledge strategy for the regional NRM bodies as well as serve as an authoritative information and knowledge management resource for all NRM sector staff	40 of the 56 regional NRM organisations' staff undertook the Regional Knowledge Leaders training and an additional 10 regional bodies completed their knowledge strategies—all 8 South Australian NRM organisations, NRM South Tasmania and Burnett Mary in Queensland.
NRM Toolbar	NRM Toolbar operational with NRM search engine and databases of events, funding/incentives, professional organisations, anecdotal evidence, R&D evidence, My Library, Alerts service, Knowledge Needs and Evidence Base repository software	All *NRM Navigator* (previously *NRM Toolbar*) functionality completed as well as the Program Logic add-on to the *Evidence Base* software.
Supporting Knowledge Brokering in the NRM sector	Gotta Question service (previously called Ask a Librarian) to provide personal help to regional NRM staff find information Supporting NRM practitioners to share innovations—through Communities of Practice Contribute to the development of regional knowledge sharing events Contribution to management practice synthesis	All targets were met and the current Community of Practice of Friends of the RKRK maintains a high usage. Both systematic reviews delivered.

2.9 Corporate governance and management

Land & Water Australia is a rural R&D corporation within the Australian Government's Agriculture, Fisheries and Forestry portfolio, but it ceased normal operations when advised by the Minister, the Hon. Tony Burke, in April 2009 that it was to be wound up. Since that time, Land & Water Australia has focused on an orderly wind-up of its affairs. It is anticipated that the organisation will cease all operations on or about 31 December 2009.

Its legislated title is the Land and Water Resources Research and Development Corporation. It was established on 3 July 1990 under the PIERD Act 1989, which provides a foundation for its accountability to Parliament and to natural resource users and managers across Australia.

Land & Water Australia also operates under the provisions of the CAC Act 1997, which applies high standards of accountability while providing sufficient independence to conduct national research programs.

Rural R&D Corporations take a leading national role in planning, investing in and managing research. Their enabling legislation requires them to treat research as an investment in economic, environmental and social benefits to their industries and to the people of Australia. They strive to deliver high rates of return on research investments by translating research outputs into practical outcomes.

2.9.1 Corporate governance principles

Operations of Land & Water Australia are overseen by a Board of Directors comprising a Chairman, five to seven non-executive Directors, and an Executive Director. The Board of Land & Water Australia is committed to the highest standards of corporate governance, in accordance with required statutes and principles, and provides strategic direction to the organisation.

Internal and external audits are carried out and other measures are in place to ensure that operations are in accordance with the accountability provisions of the CAC Act. These measures include induction training for directors, compliance and due diligence checks, disclosure of potential conflicts of interests, risk identification and management, and systems for monitoring performance. An evaluation framework applies to director performance in accordance with corporate governance principles. The Board has an agreed charter under which it operates. The charter provides for the maintenance of ethical standards, and a checklist of legal and ethical requirements is completed at every Board meeting. Risk analysis is updated and considered by the Board quarterly. The policy framework provides for Directors to seek independent advice through the Executive Director. Periodic, independent evaluations of performance are conducted at least once in the life of each Board.

This annual report includes (in this section and in sections 2.2 to 2.6) a summary of corporate governance matters, including a description of how strategic directions, policies and processes have been applied during the year. The Board of Land & Water Australia continually reviews policies and processes concerning all major operations, and has strategic influence through its internal committees such as Audit & Finance. Various R&D program management committees are established to oversee program design and management, ensuring that desired program outputs are being met and that partnership and government funds are spent wisely.

Section 3 of the PIERD Act specifies the legislative objects of rural R&D corporations. The objects are essentially to fund and administer R&D with a view to carrying out development of primary industries. Sustainable use of natural resources, greater efficiency in use of the resources and skills of the community, and improved accountability for expenditure are major interests.

The Minister is empowered by the Act to approve Land & Water Australia's five year R&D and annual operational plans, to appoint the Board chairman, and to approve nominees for membership of the Board.

2.9.2 Responsible Ministers

During the reporting year the responsible minister was the Minister for Agriculture, Fisheries and Forestry, the Hon Tony Burke MP.

In September 2008 the Minister directed LWA to adopt all elements of the Australian Bargaining Framework. LWA acted in accordance with this direction, and worked towards workplace arrangements that included a Collective Agreement, which was intended to take effect from 1 July 2009. This work ceased when the Corporation was advised that it was to be wound up and all staff were given notice of redundancy. The Minister did not give LWA any other directions.

2.9.3 Important Australian Government rural policy frameworks

Policy frameworks which are significant to Land & Water Australia include the Australian Government national research priorities, the Australian Government rural research and development priorities, the *Caring for Our Country* initiative, the *National Water Initiative* and the *National Plan for Water Security.*

2.9.4 Representative organisations

The two representative organisations with major stakeholder status and memberships comprising key natural resource users and managers are the National Farmers' Federation (NFF) and the Australian Conservation Foundation. Funding of $21,364 (excluding GST) was provided to the National Farmers' Federation in 2008–09 for an exhibition booth and in sponsorship of the NFF Congress, and $734 (excluding GST) of travel expenses reimbursed for the Chair of the NFF Land and Vegetation Committee to attend a LWA strategic planning workshop. No funding was provided to the Australian Conservation Foundation during 2008–09.

2.9.5 Transparency of research project information

Research projects current during 2008–09 are listed in Appendix 1, and details are on the Corporation's website (lwa.gov.au). It is proposed to upload the details early in the 2009–10 year to the publicly available database www.aanro.net as part of the *Australian Agriculture and Natural Resources Online* information service. Details of printed publications emanating from research projects are also on the Corporation's website, together with information on how they can be ordered free of charge.

2.9.6 Risk management and fraud control

Relative to other organisations Land & Water Australia (LWA) is considered to be low risk. Yet LWA still faces a range of risks that can significantly affect achievement of its objectives. Risk is inherent in the achievement of its corporate strategies and in attaining the objectives of its programs and projects at every level of LWA activity.

Given the research and knowledge brokering role of LWA, the management of risk is seen as a key contributor to its performance, to communication and to stakeholder confidence. It is essential for decision making, for management of resources and controls, and for corporate learning and resilience.

LWA aims to minimise risks in areas such as health, safety and the environment. However, to be effective in its broader business endeavours, LWA cannot adopt a negative approach or avoid risk taking.

To maximise our overall performance, it is necessary to operate at the cutting edge of new knowledge and to accept that the concept of managed risk is a crucial and necessary part of our work. Also our stakeholders would quite rightly expect that LWA continue to excel at managing risk.

LWA's risk management approach emphasises risk management that is:

- **dynamic**—responsive to change and assists corporate learning and continuous improvement
- **systematic**—rigorous, transparent and explicit, taking into account stakeholder perspectives
- **integrated** and embedded so far as practicable into established management planning, decision-making and reporting processes.

Accordingly, risk management at LWA is based on the better practice principles and processes as outlined in the International Standard ISO31000 *Risk Management—principles and guidelines on implementation* which in turn is based on the Australian/New Zealand standard AS4360 *Risk Management*.

Land & Water Australia's risk management plan is integrated into its daily activities and overseen by the management team and the Audit committee. The plan seeks to protect the public and commercial position of the Corporation and its employees, information and property. A risk register identifies each risk, describes its probability, likely consequences and mitigation strategy, and records the status of the mitigation strategy.

The risk management policy also incorporates a fraud control framework as prescribed by AS/NZS 4360 and Commonwealth Fraud Control Policy and Guidelines.

LWA's *Fraud Control Plan* represents LWA's commitment to effective fraud management

and control. The desired outcome of this commitment is to minimise the potential for instances of fraud on Agency programs or activities, whether by employees or by persons external to LWA.

The plan was reviewed regularly by the Board's Audit & Finance Committee to ensure that it remained relevant to the Corporation's business. Internal audits, an important component of the risk management framework, were managed by the Audit Committee. The *Risk Management Plan* and the *Fraud Control Plan* were both substantially reviewed and revised during 2008–09. No incidence of fraud was detected during 2008–09.

2.9.7 Commonwealth disability strategy

Land & Water Australia implemented the strategy to an extent appropriate to the functions and size of the Corporation. The Corporation's premises have easy, safe access for people with special orientation and mobility requirements. The Corporation's recruitment and staff development practices sought to eliminate disadvantage due to disabilities.

2.9.8 Indemnities and insurance premiums for officers

Land & Water Australia has comprehensive insurance cover with the Australian Government insurer ComCover for its directors and officers. In accordance with the contract of insurance with ComCover, Land & Water Australia is prohibited from disclosing details of insurance.

2.9.9 Directors' interests policy

In accordance with the CAC Act, the Board of Land & Water Australia has a process to manage all direct and indirect conflicts of interest, including directors' formal declarations of their interests at each meeting, documented in the minutes of the meeting. This policy extends to all committees of Land & Water Australia.

2.9.10 Entering into agreements

The Corporation entered into a wide range of program management agreements with collaborative partners in research programs, and a wide range of contracts with researchers and research agencies to invest in research congruent with the Corporation's *2005-2010 Strategic R&D Plan*. The Corporation has not entered into any new contracts for R&D activities since being advised by the Minister of the cessation of LWA. Program partners are listed in this report in the section on Strategy 1, Research investment. All research projects current during 2008-09 are listed in Appendix 1.

2.10 Board membership and processes

2.10.1 Board membership

The Board of Land & Water Australia (standing from L–R) Ms Dianne Bentley, Dr Stuart Blanch, Ms Sharon Starick, Dr Michael Robinson, Mr Rowan Foley, Mr David Eyre. (seated, from L–R) Dr Nick Austin, Mrs Bobbie Brazil, Professor Ted Lefroy.

In accordance with Section 16 of the PIERD Act, the Board of Land & Water Australia comprises a Chairman selected and appointed by the Minister, a number of non-executive directors nominated by an independent selection committee and appointed by the Minister, and an Executive Director appointed by the Land & Water Australia Board. The Chairman and other directors (except for the Executive Director) are appointed for a term not exceeding three years and are eligible for re-appointment. Directors are selected to reflect a balance of expertise in appropriate areas specified in Section 131 of the PIERD Act. They are not appointed as representatives of the organisations of sectors with which they are associated.

2.10.2 Director biographies

Roberta (Bobbie) Brazil LLM (UQ), LLB, BA, Grad Dip LP (QUT)
Chairman (non-executive)

Service as Chairman of the Board of Land & Water Australia began for Roberta (Bobbie) Brazil in July 2001. In addition to representing Land & Water Australia at this level she has served on board committees and held positions with organisations that share interests in sustainable primary production, protection and restoration of the natural environment, and the advancement of knowledge. In addition, she has been a member of several primary industry bodies ranging from the Condamine River Basin Irrigators Association and the Northern Territory Cattlemen's Association, which reflect the interests of her family's mixed farming and pastoral business.

Nick Austin PhD (Melb), MSM (Syd), BE(Agric) Hons (Melb), CID, GAICD
Director (non-executive)

Appointed to the Board of Land & Water Australia in July 2008, Nick Austin's background is in agricultural and natural resource research and policy. A hydrologist by training, he has undertaken or managed research programs in most major irrigated commodities. He is currently Executive Director of the NSW Department of Primary Industries and leads the Department's Agriculture, Biosecurity and Mine Safety Division. He formerly led the Department's Science and Research Division. He has been a Director of the Value Added Wheat and Australian Sheep Industry Cooperative Research Centres, and sits on a number of national committees.

Dianne Bentley BSc (Agric), MAICD
Director (non-executive)

Joining the Board of Land & Water Australia in July 2005, Dianne Bentley brought extensive experience in natural resource matters, particularly integrated catchment management. She is Assistant Commissioner of the Natural Resources Commission of New South Wales and has chaired the Liverpool Plains Land Management Committee. She has served on the Northern Regional Panel of the Grains Research and Development Corporation and with the Cotton Catchment Communities Cooperative Research Centre as a director.

Stuart Blanch
Director (non-executive)

Appointed to the Board of Land & Water Australia in July 2008, Stuart Blanch is from a farming family on the NSW north coast and has worked in river and catchment management for the past 10 years. He is currently Coordinator of the Environment Centre NT. He has worked in land and water management for the Inland Rivers Network, Australian Conservation Foundation, WWF-Australia and NSW Department of Environment and Conservation. He currently focuses on the significant opportunities for conserving and sustainably using Northern Australia's globally important rivers and savannas. He has expertise and interest in the National Water Initiative and the National Water Plan. He is a member of the Northern Australia Land and Water Taskforce, and Secretary of the Natural Resource Management Board (NT). He lives in Darwin.

David Eyre MEnvS, BSc, (U Melb), GAICD
Director (non-executive)

Appointed to the Board of Land & Water Australia in July 2008, David Eyre's background is in natural resource policy, research and information technology. He is currently Policy Manager with the NSW Farmers' Association, Australia's largest farmer representative body, and works closely with the National Farmers' Federation on national policy issues including climate change adaptation and emissions trading. He previously held senior policy and science roles with the NSW Government working on the NSW water, native vegetation and forestry reforms and directing the NSW Salinity Information Program. He is a graduate of the Australian Institute of Company Directors and the NSW Premier's Department Executive Development Program. His research interests include climate change, sustainable farming technologies, market-based instruments and opportunities for renewable energy in regional Australia.

Rowan Foley
Director (non-executive)

Rowan Foley was appointed to the Board of Land & Water Australia in July 2008, having had a strong connection with the land all his life and experience in land management and policies for the best use and protection of natural environments. Currently the Chief Executive Officer with the Central Desert Shire Council in the Northern Territory, which covers 282,000 square kilometres and supports nine communities and significant mining and pastoral businesses, he has brought to the Board a high level of management skill. In addition, he has a valuable knowledge of Aboriginal traditions and values. Positions held during Rowan Foley's career include ranger, environment officer, planning and research officer, and park manager.

Ted Lefroy PhD, BSc (Agric) (UWA)
Director (non-executive)

Ted Lefroy was first appointed to the Board of Land & Water Australia in July 2005. He trained as agronomist, working in Queensland, Papua New Guinea and Western Australia, before starting a research career focused on the environmental consequences of agriculture. In 2003 he was awarded a Eureka prize for research into the sustainability of grain production. Since 2005 he has been Director of the Centre for Environment at the University of Tasmania.

Michael Robinson PhD (U Melb), BSc Hons (ANU)
Executive Director

Appointed in November 2006, Michael Robinson has worked in research, communication, business development and policy, in Australia and New Zealand, and is passionate about research informing sustainable and productive landscape management. He currently leads the National Climate Change Research Strategy for Primary Industries and is a member of the Primary Industries Standing Committee Research and Development Subcommittee.

Prior to joining Land & Water Australia he was Chief Executive Officer with the Cooperative Research Centre for Greenhouse Accounting. He has also worked with CSIRO in business development, management and communication roles, focusing on environmentally sustainable forestry, and with the Heartlands Initiative (a large, multi-agency research and land-use change project working with landholders in southern New South Wales and northern Victoria). Trained as a scientist, his PhD examined the sustainability of using wastes to fertilise plantation forests, and was completed in 1999 with CSIRO and the University of Melbourne.

Sharon Starick BAgSc Hons (U Adel)
Director (non-executive)

Sharon Starick was appointed to the Board of Land & Water Australia in July 2008. A cereal and pig producer from South Australia, Sharon Starick has combined her primary production interests with conservation and natural resource management. Her background includes time as a landcare officer with the Department of Primary Industries and Resources SA, and as Executive Officer to three Soil Conservation Boards and the Soil Boards Community Action for Rural Environment Committee. She has also had advisory roles relating to rural adjustment and has participated in her local catchment management group. Service has been given on the Mallee Sustainable Farming Board, the Pork Industry Development Board, Natural Resource Management Council and the Community Advisory Committee for the Murray-Darling Basin Ministerial Council. She is a graduate of the Murray-Darling Basin Leadership program and the Australian Institute of Company Directors.

2.10.3 Committees of the Board

In 2008–09, committees which dealt with matters affecting the Board were the Audit Committee, the Finance Committee, the Audit and Finance Committee, and the Knowledge and Adoption Sub-Committee.

The Audit Committee, comprising four non-executive directors, internal and external auditors, an independent member, the Chief Financial Officer (observer) and Executive Director (observer), helps with CAC Act compliance and provides a forum for communication between directors, senior managers and external and internal auditors.

The Finance Committee, comprising two non-executive directors, the Executive Director, the Chief Financial Officer (observer) and Financial Controller (observer), considers financial matters affecting the Corporation.

The Knowledge and Adoption Sub-committee, comprising three non-executive directors, the Executive Director (observer), and the Research and Knowledge Executive Manager (observer), approves the knowledge and adoption strategy and oversees its implementation.

The Audit and Finance Committees were combined by the LWA Board on 22 May 2009 due to the wind-up of the Corporation. The Committee is directly responsible and accountable to the Board for the exercise of its responsibilities. The Committee's responsibilities include risk management, control framework, external accountability, legislative compliance, internal audit, external audit and reviewing of financial statements. The Committee comprises of five non-executive directors and an independent chair, with observers including internal and external auditors, Executive Director, Chief Financial Officer and Financial Controller. Membership of these committees changed part way through the year.

The Board operates other committees to assist in the management of specific research programs.

2.10.4 Board and Committee meeting attendance

The number of meetings attended by directors and officers during 2008–09 are shown in the table below.

Table 4 Board and committee meeting attendance

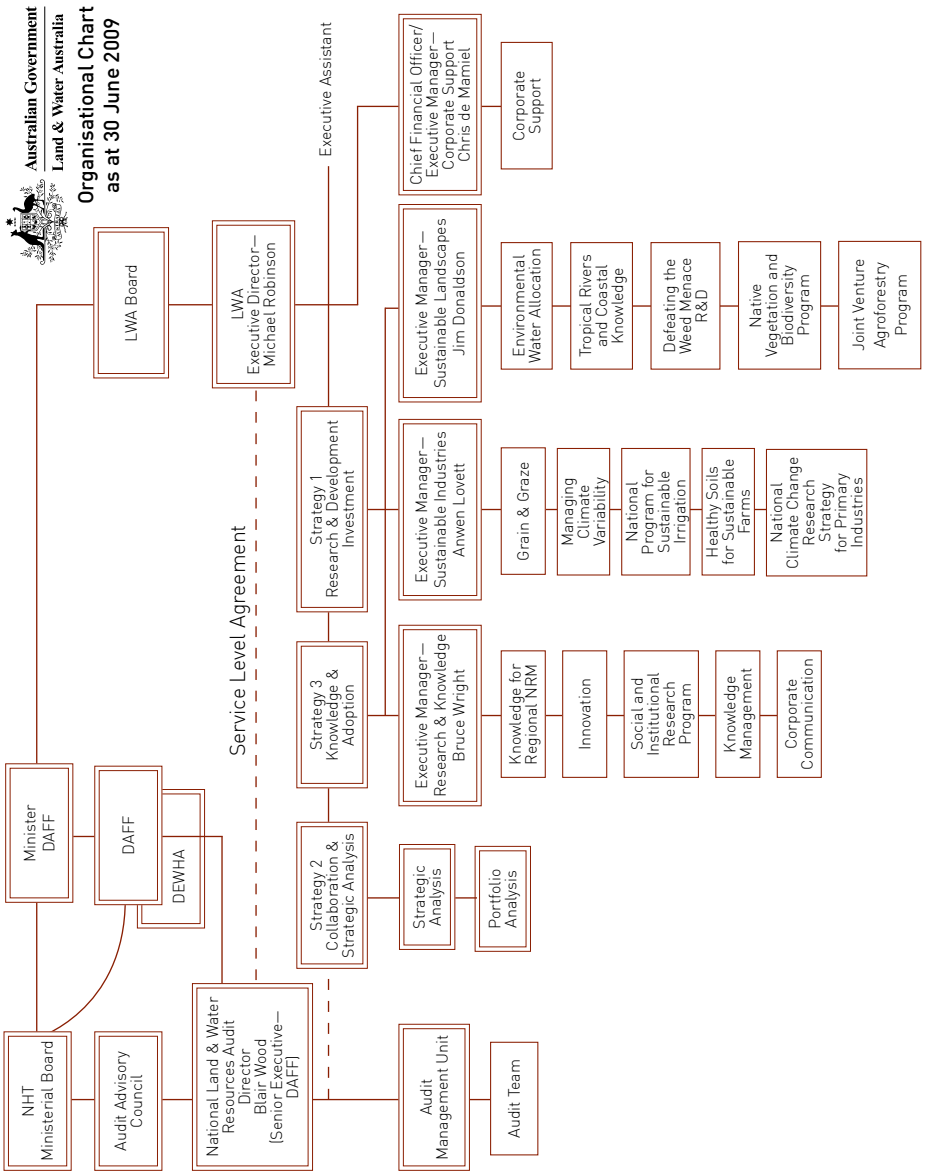
	Audit Committee Meetings	Audit and Finance Committee Meetings	Board Meetings§	Knowledge and Adoption Sub-committee Meetings	Finance Committee Meetings
Number of Meetings Held	3	1	6	3	5
Nick Austin		1	5		3
Dianne Bentley ±	1	1	4		5
Stuart Blanch	2	1	5		
Roberta Brazil º	1		6	3	
David Eyre	2	1	5		
Rowan Foley			5	1	
Ted Lefroy¤			6	3	
Michael Robinson∆	3	1	6	3	5
Sharon Starick	1		5		

§ two extraordinary Board meetings were held in May 2009
º Chair of Board
± Chair of Finance Committee
¤ Chair of Knowledge and Adoption Sub-Committee
∆ Executive Director

2.11 Land & Water Australia staff

Land & Water Australia staff support the establishment, management, adoption and evaluation of research projects, as well as provide corporate services. At 30 June 2009, 41.27 full-time equivalent staff were employed.

Land & Water Australia finances and manages research projects across the nation, but operates from headquarters at Level 1, Phoenix Building, 86 Northbourne Avenue, Braddon ACT.



2.11.1 Employment agreements

All LWA staff are employed under Individual Employment Agreements. Late in 2008 staff expressed a preference to be covered by a Union Collective Agreement and negotiations were undertaken with the Community and Public Sector Union to formalise an agreement.

2.11.2 Performance management

Land & Water Australia has a comprehensive performance management system, which includes annual and mid-term reviews of performance. The performance management arrangements are consistent with government policy and good practice as they connect remuneration advancement to individual and organisational productivity and performance, and emphasise ongoing communication and feedback. Performance management guidelines were last updated in early 2008, along with an update of position descriptions for all staff.

2.11.3 Staff development

Importance is placed on recruiting, developing and retaining people with high quality skills. Training and development opportunities are not limited to formal qualifications, but may also include short courses and secondments. Each staff member's performance management agreement incorporates a training and development plan.

2.11.4 Occupational health and safety

Land & Water Australia complies with both the *Occupational Health and Safety (Commonwealth Employment) Act 1991* and the *ACT Occupational Health and Safety Act 1989*. Land & Water Australia's occupational health and safety (OH&S) policy sets out corporate and staff obligations with respect to OH&S.

A friendly, supportive and continual learning environment for staff members is promoted. Activities during the year which contributed to promoting the health, safety and morale of the organisation included influenza vaccinations, a fitness and healthy living allowance for all eligible staff, and OH&S reviews of workstations on a regular basis.

Staff are able to seek personal and professional support services from the Land & Water Australia's Employee Assistance Program (EAP) service provider, Davidson Trahaire Corpsych, which is a confidential service that staff may use to up to three times per calendar year.

There were no reports of any accidents or dangerous occurrences during the year that required notice to be given under Section 68 of the OH&S Act. No OH&S investigations were conducted during the year.

2.11.5 Sustainability practices

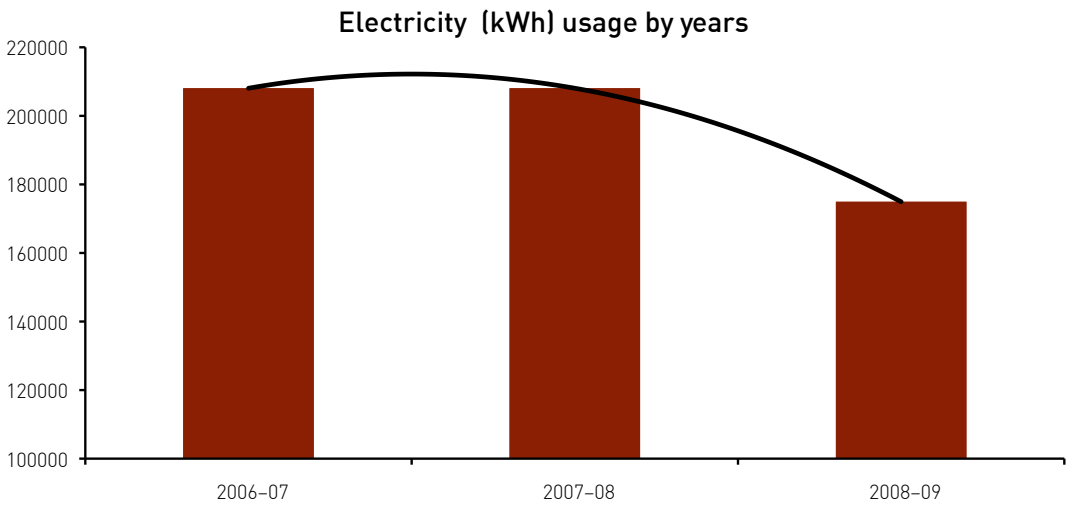
Land & Water Australia requires that sustainability of the natural resource base is the overriding objective when researchers and others are designing research projects and programs. Project contracts have specific clauses requiring providers to minimise negative environmental impacts. A significant number of projects across the research portfolio actively progress the intent of the *Environment Protection and Biodiversity Conservation Act 1999*. The mission and work of LWA advance the Government's principles of ecologically sustainable development.

As an organisation with such strong ecological aims and objectives, Land & Water Australia is also focused on sustainability and good environmental practices in the Corporation's internal office operations. Previously initiated actions, such as using Desert Cube waterless urinal systems, defaulting printers to duplex for internal printing, using sensors to control lights in meeting rooms and enclosed offices, and using recycled paper for office printing, have continued. Staff reduced their air miles by using conference calls and programs such as *Skype* for essential meetings.

There has been a continued overall reduction in all the major indicators (energy, travel and paper used) that contribute to LWA's environmental footprint. The progress made is best shown by the full-time equivalent (FTE) comparison, which shows that even with reduced staff numbers and the same office requirements, great progress is being made.

One significant measure taken this financial year was the introduction of a 'virtual computer server infrastructure' for Land & Water Australia in January 2009. This resulted in the reduction of the total number of servers and therefore a significant reduction (10 per cent) in electricity consumption for the server room in comparison to the same months from the previous year. Land & Water Australia's electricity consumption overall has seen a significant downward trend over the last three years.

	2006–07	2007–08	2008–09
FTE	57.5	60.0	46.4
Air miles/FTE	17,535	15,584	10,918
Plane Trips/FTE	27.6	26.5	14.9
Pages printed/FTE	15,684	13,628	13,721
Tonnes CO_2	5.68	5.00	4.78



2.12 Freedom of information statement

As an Australian Government statutory authority, Land & Water Australia is subject to the *Freedom of Information Act 1982*.

Documents relating to R&D activities funded by the Corporation are held at the office in Canberra, and are generally free to download from the Land & Water Australia website (lwa.gov.au).

Freedom of information statistics

- Freedom of information requests received: nil.
- Internal review received: nil.
- Administrative Appeals Tribunal appeals: nil.

Facilities and procedures for freedom of information access

Members of the public can examine documents at Land & Water Australia's office in Canberra by contacting the Chief Financial Officer on (02) 6263 6000. Office hours are Monday to Friday between 8.30am and 5.00pm. Access to the documents incurs a fee as prescribed under the *Freedom of Information Act*. This statement is correct to 30 June 2009.

After the cessation of Land & Water Australia, documents will be available from the Department of Agriculture, Fisheries and Forestry.

Documents available from Land & Water Australia

Category	Nature
Planning documents including the *2005–2010 Strategic R&D Plan* and *Annual Operational Plan 2008–2009*	Files Publications
Annual reports	Files Publications
Applications and agreements	Files and forms
Financial and project administration	Files Electronic data publications
Information relating to the commercialisation of R&D	Files
R&D Plans	Files
R&D reports and occasional papers	Files Publications
Staff administration and personnel	Files

2.13 Compliance with Australian Government statutes and policies

The following table presents a summary of Land & Water Australia's compliance with specific statutes and government priorities. Page numbers refer to where in the Annual Report relevant information on the compliance can be found.

Relevant statute	Requirement	Compliance comments	Page/s
Clause 3 of Part 1 ROO Schedule[1]	Exemption from the Finance Minister	No written exemption has been granted	p126
Clause 4 of Part 1 ROO Schedule	Certification of the Report of Operations by Directors	Compliant	p10
Clause 6 (1-3)of Division 1 of Part 2 ROO Schedule	Standards of presentation	Compliant	pp9–130
Clause 6 (4) of Division 1 of Part 2 ROO Schedule	Accompanying or incorporated reports consistent with Report of Operations	Compliant	pp1–8 and 131–219
Clause 7 of Division 1 of Part 2 ROO Schedule	Obtaining information from subsidiaries	Not applicable – LWA has no subsidiary	p126
Clause 8 (a) of Division 2 of Part 2 ROO Schedule	Enabling legislation and its objectives and functions	Compliant	pp10–12
Clause 8 (b) of Division 2 of Part 2 ROO Schedule	Responsible Minister during reporting period	Compliant	p112
Clause 9 of Division 2 of Part 2 ROO Schedule	Outline of organisational structure and base location	Compliant	p122
Clause 10 of Division 2 of Part 2 (1)(a) ROO Schedule	Review of performance against statutory objects and functions, corporate plan, and principal outputs and contribution to outcomes	Compliant	pp14–110
Clause 10 of Division 2 of Part 2 (2)(a) & (b) ROO Schedule	Address the efficiency and effectiveness of operations and clear links outcomes and principal outputs	Compliant	pp14–24

Clause 10 of Division 2 of Part 2 (1)(b) ROO Schedule	Information on the factors, events or trends that influenced performance and may influence future performance	Compliant	pp13–14
Clause 10 of Division 2 of Part 2 (c) ROO Schedule	Information on significant events as defined in Section 15 of the CAC Act	Not applicable – No such events occurred	p127
Clause 10 of Division 2 of Part 2 (d) ROO Schedule	Information on the operational and financial results of LWA, including its principal outputs, major investing and financing activities, and key performance indicators	Compliant	pp14–110
Clause 10 of Division 2 of Part 2 (e) ROO Schedule	Information on significant changes in LWA's state of affairs or principal activities	Compliant	pp13–14
Clause 10 of Division 2 of Part 2 (f) ROO Schedule	Information on developments that have significantly affected or may affect future operations, the results of operations, or LWA's state of affairs in future	Compliant	pp13–14
Clause 11 of Division 2 of Part 2 ROO Schedule	Judicial decisions and reviews by outside bodies	No such decisions or reports	p127
Clause 12 of Division 2 of Part 2 (1)(a) ROO Schedule	Details of directions issued by responsible Minister under the enabling legislation	Compliant	p112
Clause 12 of Division 2 of Part 2 (1)(b) ROO Schedule	Details of notifications of general policies:	Compliant	pp127-128
	Commonwealth fraud Control guidelines 2002	Compliant	
	Foreign exchange risk management policy	Compliant	
	Cost recovery policy	Compliant	
	National Code of Practice for the Construction Industry (National Code) and the Australian Government Implementation Guidelines for the National Code of Practice for the Construction Industry (Implementation Guidelines)	Compliant	

	Australian Government Property Ownership Policy 2005	Compliant	
	Protective Security Manual 2005	Compliant	
	Procurement under S47A of the CAC Act	Compliant	
Clause 14 of Division 3 of Part 2 ROO Schedule	Particulars of Directors	Compliant	pp115–121
Clause 15 of Division 3 of Part 2 ROO Schedule	Statement on governance	Compliant	pp111–114 & p121
Clause 16 of Division 3 of Part 2 ROO Schedule	Indemnities and insurance premiums for officers	Compliant	p114
Clause 17 of Division 4 of Part 2 ROO Schedule	Other statutory requirements	Compliant	pp126–129
Section 74 of the OH&S Act[2]	Details on occupational health and safety	Compliant	p123
Section 8 (1) of the FOI Act[3]	Details on freedom of information	Compliant	p125
Section 516A of the EPBC Act[4]	Details on ecologically sustainable development and environmental matters	Compliant	p123
Commonwealth Fraud Control Guidelines	Fraud control plans and risk assessments	Compliant	p113
Clause 18 of Division 4 of Part 2 ROO Schedule	Commonwealth disability strategy	Compliant	p114
S28 (1) (a) (i) PIERD Act[5]	R&D Activities	Compliant	pp25–110
S28 (1) (a) (ii) PIERD Act	Amount spent on R&D	Compliant	pp14–17 & pp25–110
S28 (1) (a) (iia) PIERD Act	Ecologically sustainable development	Compliant	pp20–21
S28 (1) (a) (iib) PIERD Act	Impact on primary industry	Compliant	pp12 & pp25–110

S28 (1) (a) (iii) PIERD Act	Revisions of R&D Plan or AOP	Compliant – there were no revisions finalised or approved	p99 and p129
S28 (1) (a) (iv) PIERD Act	Entering into of agreements	Compliant	p114
S28 (1) (a) (v) PIERD Act	Applying for patents or licences for inventions	Compliant – no patents were applied for an no licences for patented inventions entered into	p129
S28 (1) (a) (vi) PIERD Act	Activities of companies	Compliant – LWA has no interest in any company	p129
S28 (1) (a) (vii) PIERD Act	Formation of a company	Compliant –LWA has undertaken no activity to form a company	p129
S28 (1) (a) (viii) PIERD Act	Acquisitions and dispositions of real property	Compliant – LWA has neither acquired nor disposed of significant real property	p129
S28 (1) (b) (i) & (ii) PIERD Act	Extent to which operations achieved objectives of R&D plan and AOP	Compliant	pp22–110
S28 (1) (c) PIERD Act	Extent to which operations contributed to attainment of objectives of the PIERD Act	Compliant	pp12–110
S28 (1) (d) PIERD Act	Details of industry funds and levies	Not applicable	
	Links to National and Rural Research Priorities	Compliant	pp18–21

1 The ROO Schedule is the Report of Operations Schedule of the Commonwealth Authorities and Companies (Report of Operations) Orders 2008 under section 48 of the Commonwealth Authorities and Companies Act 1997.

2 The OH&S Act is the *Occupational Health and Safety (Commonwealth Employment) Act 1991*

3 The FOI Act is the *Freedom of Information Act 1982*

4 The EPBC Act is the *Environment Protection and Biodiversity Conservation Act 1999*

5 The PIERD Act is the *Primary Industries and Energy Research and Development Act 1989*

3. Financial statements

Financial statements for the year ended 30 June 2009

INDEPENDENT AUDITOR'S REPORT

To the Minister for Agriculture, Fisheries and Forestry

Scope

I have audited the accompanying financial statements of the Land and Water Resources Research and Development Corporation (the Corporation) for the year ended 30 June 2009, which comprise: a Statement by the Directors and the Chief Executive; Income Statement; Balance Sheet; Statement of Changes in Equity; Cash Flow Statement; Schedule of Commitments; and Notes to and forming part of the Financial Statements, including a Summary of Significant Accounting Policies.

The Directors' Responsibility for the Financial Statements

The directors are responsible for the preparation and fair presentation of the financial statements in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997,* including the Australian Accounting Standards (which include the Australian Accounting Interpretations). This responsibility includes establishing and maintaining internal controls relevant to the preparation and fair presentation of the financial statements that are free from material misstatement, whether due to fraud or error; selecting and applying appropriate accounting policies; and making accounting estimates that are reasonable in the circumstances.

Auditor's Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Corporation's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Corporation's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial statements.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting the audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

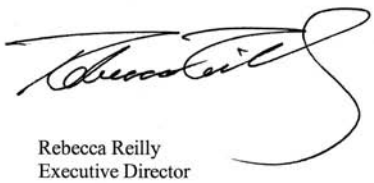
Auditor's Opinion

In my opinion, the financial statements of the Land and Water Resources Research and Development Corporation:

(a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997,* including the Australian Accounting Standards; and

(b) give a true and fair view of the matters required by the Finance Minister's Orders including the Land and Water Resources Research and Development Corporation's financial position as at 30 June 2009 and its financial performance and cash flows for the year then ended.

Australian National Audit Office



Rebecca Reilly
Executive Director

Delegate of the Auditor-General

Canberra
4 September 2009

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
STATEMENT BY THE DIRECTORS AND CHIEF EXECUTIVE

In our opinion, the attached financial statements for the year ended 30 June 2009 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Corporation will be able to pay its debts as and when they become due and payable.

This Statement is made in accordance with a resolution of the directors.

Anthea Tinney Chair	Michael Robinson Executive Director	Chris de Mamiel Chief Financial Officer
3 September 2009	3 September 2009	3 September 2009

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
INCOME STATEMENT
for the period ended 30 June 2009

	Notes	**2009** **$**	2008 $
INCOME			
Revenue			
Revenue from Government	**3A**	**13,018,000**	13,019,000
External contributions	**3B**	**10,517,724**	24,433,409
Interest	**3C**	**923,980**	1,157,897
Other revenue	**3D**	**55,181**	254,761
Total revenue		**24,514,885**	38,865,067
Total Income		**24,514,885**	38,865,067
EXPENSES			
Employee benefits	**4A**	**5,593,253**	5,266,242
Suppliers	**4B**	**8,018,115**	8,342,060
Depreciation and amortisation	**4C**	**418,105**	389,258
Write-down and impairment of assets	**4D**	**468,474**	-
Losses from asset sales	**4E**	**-**	1,625
Research and development	**4F**	**15,048,356**	24,699,308
Total Expenses	**5**	**29,546,303**	38,698,493
Surplus (Deficit)		**(5,031,418)**	166,574

The above statement should be read in conjunction with the accompanying notes.

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
BALANCE SHEET
as at 30 June 2009

	Notes	2009 $	2008 $
ASSETS			
Financial Assets			
Cash and cash equivalents	6A	**13,260,374**	17,154,179
Trade and other receivables	6B	**981,248**	2,420,121
Total financial assets		**14,241,622**	19,574,300
Non-Financial Assets			
Land and buildings	7A	**27,452**	538,199
Plant and equipment	7B	**31,785**	110,783
Intangibles	7D	**73,403**	570,420
Other non-financial assets	7F	**17,440**	425,029
Total non-financial assets		**150,080**	1,644,431
Total Assets		**14,391,702**	21,218,731
LIABILITIES			
Payables			
Suppliers	8A	**249,084**	437,537
Other payables	8B	**1,841,445**	4,897,111
Total payables		**2,090,529**	5,334,648
Provisions			
Employee provisions	9A	**1,530,687**	548,344
Other provisions	9B	**952,684**	160,000
Total provisions		**2,483,371**	708,344
Total Liabilities		**4,573,900**	6,042,992
Net Assets		**9,817,802**	15,175,739
EQUITY			
Reserves		**9,709,276**	13,395,373
Retained surplus		**108,526**	1,780,366
Total Equity		**9,817,802**	15,175,739
Current Assets		**14,259,062**	19,999,329
Non-Current Assets		**132,640**	1,219,402
Current Liabilities		**4,245,089**	5,687,302
Non-Current Liabilities		**328,811**	355,690

The above statement should be read in conjunction with the accompanying notes.

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
STATEMENT OF CHANGES IN EQUITY

as at 30 June 2009

	Retained Earnings		Asset Revaluation Reserve		Research and Development Reserve		Total Equity	
	2009	2008	**2009**	2008	**2009**	2008	**2009**	2008
	$	$	**$**	$	**$**	$	**$**	$
Opening balance	**1,780,366**	1,306,700	**326,519**	188,667	**13,068,854**	13,375,946	**15,175,739**	14,871,313
Adjusted opening balance	**1,780,366**	1,306,700	**326,519**	188,667	**13,068,854**	13,375,946	**15,175,739**	14,871,313
Income and expenses recognised directly in equity								
Revaluation adjustments	**-**	-	**8,441**	137,852	**-**	-	**8,441**	137,852
Impairment	**-**	-	**(334,960)**	-	**-**	-	**(334,960)**	-
Subtotal income and expenses recognised directly in equity	**-**	-	**(326,519)**	137,852	**-**	-	**(326,519)**	137,852
Surplus (Deficit) for the period	**(5,031,418)**	166,574	**-**	-	**-**	-	**(5,031,418)**	166,574
Total income and expenses	**(5,031,418)**	166,574	**(326,519)**	137,852	**-**	-	**(5,357,937)**	304,426
Transfers between equity components	**3,359,578**	307,092	**-**	-	**(3,359,578)**	(307,092)	**-**	-
Closing balance as at 30 June	**108,526**	1,780,366	**-**	326,519	**9,709,276**	13,068,854	**9,817,802**	**15,175,739**

The Research and Development Reserve represents funding which has been set aside for programs or projects, either as a result of formal agreements with external funding bodies or of Board decisions. To the extent that programs and projects are not completed by 31 December 2009 funds will be transferred to new managing agents or returned to funding bodies.

The above statement should be read in conjunction with the accompanying notes.

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION CASH FLOW STATEMENT

for the period ended 30 June 2009

	Notes	2009 $	2008 $
OPERATING ACTIVITIES			
Cash received			
Receipts from Government		**13,018,000**	13,019,000
External contributions		**13,122,299**	26,236,519
Interest		**957,062**	1,141,471
Net GST received		**1,448,419**	431,336
Research and development refunds		**224,299**	126,785
Other cash received		**68,204**	268,308
Total cash received		**28,838,283**	41,223,419
Cash used			
Employees		**4,618,961**	5,158,468
Suppliers		**7,960,269**	9,373,752
Research and development		**20,031,497**	28,400,878
Total cash used		**32,610,727**	42,933,098
Net cash from / (used by) operating activities	10	**(3,772,444)**	(1,709,679)
INVESTING ACTIVITIES			
Cash used			
Purchase of property, plant and equipment		**121,361**	78,029
Purchase of intangibles		**-**	61,534
Total cash used		**121,361**	139,563
Net cash from / (used by) investing activities		**(121,361)**	(139,563)
Net increase (decrease) in cash held		**(3,893,805)**	(1,849,242)
Cash and cash equivalents at the beginning of the reporting period		**17,154,179**	19,003,421
Cash and cash equivalents at the end of the reporting period	6A	**13,260,374**	17,154,179

The above statement should be read in conjunction with the accompanying notes.

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
SCHEDULE OF COMMITMENTS

as at 30 June 2009

	2009	2008
	$	$
BY TYPE		
Commitments receivable		
GST recoverable on commitments	**(1,237,912)**	(1,613,976)
Other commitments		
Operating lease[1]	**73,714**	1,532,928
Goods and services contracts[2]	**40,109**	8,457
Research and development[3]	**13,503,211**	16,212,347
Total other commitments	**13,617,034**	17,753,732
Net Commitments by Type	**12,379,122**	16,139,756
BY MATURITY		
Commitments receivable		
One year or less	**(907,601)**	(1,043,487)
From one to five years	**(330,311)**	(570,489)
Over five years	**-**	-
Total commitments receivable	**(1,237,912)**	(1,613,976)
Commitments payable		
Operating lease commitments		
One year or less	**73,714**	578,267
From one to five years	**-**	954,661
Total operating lease commitments	**73,714**	1,532,928
Other commitments		
One year or less	**9,909,895**	10,900,082
From one to five years	**3,633,425**	5,320,722
Over five years	**-**	-
Total other commitments	**13,543,320**	16,220,804
Net Commitments by Maturity	**12,379,122**	16,139,756

NB: Commitments are GST inclusive where relevant.

[1] The operating lease is a rental lease for office accommodation to January 2011 with annual rent increases of 3.5%. The lease in non-cancellable except in the event that the Corporation ceases to exist. The commitment comprises minimum lease payments to 31 January 2011, reduced by lease payments payable on surplus space as the Corporation winds up. Lease payments relating to surplus space ($801,125 - GST exclusive) have been included in the current year's income statement. In the event that the Corporation ceases to exist prior to 31 January 2011 the actual liability will be less than the recorded commitment and liability.

[2] Goods and services commitments are primarily related to IT support and knowledge and adoption activity.

[3] Research and development commitments comprise amounts payable under research and development agreements in respect of which the recipient is yet to perform the services required. To the extent that programs and projects have not been completed or transferrred to a new managing agent by 31 December 2009 agreements will be terminated and commitments extinguished.

The above schedule should be read in conjunction with the accompanying notes.

LAND AND WATER RESOURCES RESEARCH AND DEVELOPMENT CORPORATION
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
forthe period ended 30 June 2009

Notes to and forming part of the Financial Statements

Note 1: Summary of Significant Accounting Policies

1.1 Basis of Preparation of the Financial Report

The financial statements and notes are required by clause 1(b) of schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are a general purpose financial report.

The Corporation was established under the *Primary Industries and Energy Research and Development Act 1989* and is controlled by the Commonwealth of Australia.

The continued existence of the Corporation in its present form and with its present programs is dependent on Government policy and on continuing appropriations by Parliament through the Department of Agriculture, Fisheries and Forestry.

The Government, as part of the 2009-2010 Budget, announced a cessation of funding for the Corporation after 2009-10 and its decision to wind-up the Corporation. The Minister of Agriculture, Fisheries and Forestry directed that the Corporation be wound up by 31 Decemeber 2009 with final financial statements, audit and annual report indicating a finalisation date of 31 December 2009. Government funding for 2009-2010 has been confirmed at $6.7million.

As a result of the Government's decision to wind-up the Corporation the financial statements have not been prepared on a going concern basis.

The financial statements have been prepared on a wind-up basis. The measurement of assets, liabilities and equity and the recognition of income, expenses, gains and losses reflect this basis.

The financial statements and notes have been prepared in accordance with:

- Finance Minister's Orders (FMO) for reporting periods ending on or after 1 July 2008; and
- Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial report has been prepared on an accrual basis and is in accordance with historical cost convention, except where an alternative convention is appropriate due to the wind-up of the Corporation. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial report is presented in Australian dollars.

Unless alternative treatment is specifically required by an accounting standard or the FMO, assets and liabilities are recognised in the balance sheet when, and only when, it is probable that future economic benefits will flow to the Corporation and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under agreements equally proportionately unperformed are not recognised unless required by an accounting standard.

Unless alternative treatment is specifically required by an accounting standard, income and expenses are recognised in the income statement when, and only when, the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Significant Accounting Judgement and Estimates

In the process of applying the accounting policies listed in this note, the Corporation has made the following judgements that have a significant impact on the amounts recorded in the financial statements.

- Directors believe that staff employed on 1 July 2009 will remain until their scheduled termination dates. Provision has been made, in the current financial year, for termination payments to the expected date of termination of such staff (Note 4A).

Notes to and forming part of the Financial Statements

- Directors have determined that 75% of leased office accommodation will be surplus to requirements between 1 July 2009 and 31 December 2009. Post 31 December 2009 100% of any leased office accommodation will be surplus to requirements. While it is expected that the Corporation will cease to exist on or around 31 December 2009 the unavoidable cost of minimum lease payments on office accommodation considered surplus to requirements to 31 Jan 2011 has been provided for in the current financial year (Note 4B). In the event that the Corporation ceases to exist prior to 31 January 2011 actual minimum lease payments will be less than the recorded provision.

- Directors have reviewed the carrying value of non-financial assets for indicators of impairment as at 30 June 2009 and have judged it necessary to reduce the assets to their recoverable amounts based on an estimate of value in use (Note 4D).

No accounting assumptions and estimates have been identified that have a significant risk of causing a material adjustment to carrying amount of assets and liabilities within the next accounting period.

1.3 New Accounting Standards

Adoption of New Australian Accounting Standard Requirements

No accounting standard has been adopted earlier than the application date as stated in the standard. The following new standards and amendments to standards are applicable to the current reporting period. Other standards have been issued or ammended which do not impact on the Corporation.

AASB1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards* (June 2007)

AASB 5 *Non-current Assets Held for Sale and Discontinued Operations*

AASB 7 *Financial Instruments: Disclosures*

AASB 101 *Presentation of Financial Statements* (Dec 2007)

AASB 116 *Property, Plant and Equipment*

AASB 137 *Provisions, Contingent Liabilities and Contingent Assets*

AASB 139 *Financial Instruments: Recognition and Measurement*

AASB 1004 *Contributions*

AASB 1048 *Interpretation and Application of Standards*

AASB 1052 *Disaggregated Disclosures*

AASB 2007-2 Amendments to Australian Accounting Standards arising from AASB Interpretation 12 [AASB 1, AASB 117, AASB 118, AASB 120, AASB 121, AASB 127, AASB 131 & AASB 139]

AASB 2007-9 Amendments to Australian Accounting Standards arising from the review of AASs 27, 29 and 31 [AASB 3, AASB 5, AASB 8, AASB 101, AASB 114, AASB 116, AASB 127 & AASB 137]

AASB 2008-10 Amendments to Australian Accounting Standards - Reclassification of Financial Assets

ASSB 2008-12 Amendments to Australian Accounting Standards - Reclassification of Financial Assets - Effective Date and Transition [AASB7, AASB 139 & AASB 2008-10]

AASB 2009-3 Amendments to Australian Accounting Standards - Embedded Derivatives [AASB 139 & Interpretation 9]

Interp 4 *Determining whether an Arrangment contains a Lease*.

Future Australian Accounting Standard Requirements

The following new standards, amendments to standards or interpretations have been issued by the Australian Accounting Standards Board but are effective for future reporting periods. It is estimated that the impact of adopting these pronouncements when effective will have no material financial impact on future reporting periods. Other standards have been issued or ammended which do not impact on the Corporation.

Notes to and forming part of the Financial Statements

AASB 1 *First-time Adoption of Australian Equivalents to International Financial Reporting Standards* (May 2009)

AASB 101 *Presentation of Financial Statements* (Sep 2007)

AASB 127 *Consolidated and Separate Financial Statements* (Mar 2008)

AASB 2007-3 Amendments to Australian Accounting Standards arising from AASB 8 [AASB 5, AASB 6, AASB 102, AASB 107, AASB 119, AASB 127, AASB 134, AASB 136, AASB 1023 & AASB 1038]

AASB 2007-6 Amendments to Australian Accounting Standards arising from AASB 123 [ASSB 1, AASB 101, AASB 107, AASB 111, AASB 116 & AASB 138 and interpretations 1 & 12]

AASB 2007-8 Amendments to Australian Accounting Standards arising from AASB 101

AASB 2007-10 Further Amendments to Australian Accounting Standards arising from AASB 101

AASB 2008-2 Amendments to Australian Accounting Standards - Puttable Financial Instruments and Obligations arising on Liquidation [AASB 7, AASB 101, AASB 132, AASB 139 & Interpretation 2]

AASB 2008-3 Amendments to Australian Accounting Standards arising from AASB 3 and AASB 127 [AASBs 1, 2, 4, 5, 7, 101, 107, 112, 114, 116, 121, 128, 131, 132, 133, 134, 136, 137, 138 & 139 and Interpretations 9 & 107]

AASB 2008-5 Amendments to Australian Accounting Standards arising from the Annual Improvements Project [AASB 5, 7, 101, 102, 107, 108, 110, 116, 118, 119, 120, 123, 127, 128, 129, 131, 132, 134, 136, 138, 139, 140, 141, 1023 & 1038]

2008-6 Further Amendments to Australian Accounting Standards arising from the Annual Improvements Project [AASB 1 & AASB 5]

2009-2 Amendments to Australian Accounting Standards - Improving Disclosures about Financial Instruments [AASB 4, AASB 7, AASB 1023 & ASSB 1038]

AASB 2009-4 Amendments to Australian Accounting Standards arising from the Annual Improvements Project [AASB 2 and AASB 138 and Interpretations 9 & 16]

AASB 2009-5 Further Amendments to Australian Accounting Standards arising from the Annual Improvements Project [AASB 5, 8, 101, 107, 117, 118, 136 & 139}

Interp 1 *Changes in Existing Decommissioning, Restoration and Similar Liabilities.*

1.4 Revenue

Revenue from Government

Funding received or receivable from the Department of Agriculture, Fisheries and Forestry (appropriated to the Department as a CAC Act body payment item for payment to the Corporation) is recognised as Revenue from Government unless it is in the nature of an equity injection.

External contributions

External contributions comprise voluntary contributions from government, industry and other organisations to particular research programs or projects. These contributions are recognised on receipt, or when receivable under contractual arrangements, in the period when the obligation is due.

Interest

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement*.

Other revenue

Revenue from the sale of goods is recognised when:

- the risks and rewards of ownership have been transferred to the buyer;

Notes to and forming part of the Financial Statements

- the seller retains no managerial involvement nor effective control over the goods;
- the revenue and transaction costs incurred can be reliably measured; and
- it is probable that the economic benefits associated with the transaction will flow to the Corporation.

Royalties are recognised when the royalty is entitled to be received by the Corporation.

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance account. Collectability of debts is reviewed at balance date. Allowances are made when collectability of the debt is no longer probable.

1.5 Gains

Sale of Assets

Gains from disposal of non-current assets are recognised when control of the asset has passed to the buyer.

1.6 Employee Benefits

Liabilities for services rendered by employees are recognised at the reporting date to the extent that they have not been settled.

Liabilities for short-term employee benefits (as defined in AASB 119) and termination benefits due within twelve months of balance date are measured at their nominal amounts.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability.

Leave

The liability for employee benefits includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the Corporation is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration, including the Corporation's employer superannuation contribution rates to the extent that the leave is likely to be paid out on termination.

Due to the planned wind-up of the Corporation, the liability for long service leave is recognised and measured on the basis that leave accrued will be paid out on termination where an employee's length of service exceeds one year.

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. The Land and Water Resources Research and Development Corporation recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

In light of the wind-up of the Corporation on 31 December 2009, provision for seperation and redundancy benefit payments has been made for all eligble employees.

Superannuation

Employees of the Corporation contribute to the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), the PSS accumulation plan (PSSap) or an approved superannuation scheme of their choice.

The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap and all other approved superannuation schemes are defined contribution schemes.

Notes to and forming part of the Financial Statements

The liability for defined benefits under CSS and PSS is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported by the Department of Finance and Deregulation as an administered item.

For CSS and PSS members, the Corporation makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Corporation's eligible employees. The Corporation accounts for the contributions as if they were contributions to defined contribution plans. For PSSap and all other approved superannuation schemes the Corporation, as employer, contributes a minimum of 9% of superannuable salaries.

The liability for superannuation recognised as at 30 June represents outstanding contributions for the period between employees' final pay in 2008-09 and 30 June 2009.

1.7 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased non-current assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains substantially all such risks and benefits.

The Corporation has no finance leases.

Operating lease payments are expensed on a straight line basis representative of the pattern of benefits derived from the leased assets.

Lease incentives, taking the form of 'free' leasehold improvements and rent holidays, are recognised as liabilities. These liabilities are reduced by allocating lease payments between rental expense and reduction of the liability.

1.8 Research and Development Expenses

Research and development expenses are expensed as incurred.

The Corporation recognises research and development provisions and liabilities. Research and development agreements require the grantee to perform services, provide facilities, or to meet eligibility criteria. Liabilities are recognised only to the extent that the services required have been performed or the performance eligibility criteria have been satisfied by the grantee. Where research and development monies are paid in advance of performance or eligibility, a prepayment is recognised.

1.9 Cash

Cash and cash equivalents includes notes and coins held and any deposits in bank accounts with an original maturity of 3 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value. Cash is recognised at its nominal amount.

Notes to and forming part of the Financial Statements

1.10 Financial Assets

The Corporation classifies its financial assets in the following categories and currently only has assets in the 'loans and receivables' category:

- at fair value through profit or loss;
- held-to-maturity investments;
- available-for-sale; and
- loans and receivables.

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition.

Financial assets are recognised and derecognised upon trade date.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis except for financial assets that are recognised at fair value through profit or loss.

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as loans and receivables. They are included in current assets, except for maturities greater than 12 months after the balance sheet date. These are classified as non current assets. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

Impairment of Financial Assets

Financial assets are assessed for impairment at each balance date.

1.11 Financial Liabilities

Financial liabilities are classified as either financial liabilities as fair value through profit or loss or other financial liabilities. The Corporation's financial liabilities are other financial liabilities.

Financial liabilities are recognised and derecognised upon trade date.

Other Financial Liabilities

Other financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs.

Other financial liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective yield basis.

The effective interest method is a method of calculating the amortised cost of a financial liability and of allocating interest expense over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash payments through the expected life of the financial liability, or, where appropriate, a shorter period.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

Notes to and forming part of the Financial Statements

1.12 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the balance sheet but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

1.13 Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

1.14 Property, Plant and Equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the balance sheet, except for purchases costing less than $2,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located. This is particularly relevant to restoration obligation provisions in property leases taken up by the Corporation where there exists an obligation to restore the property to its original condition. These costs are included in the value of the Corporation's leasehold improvements with a corresponding provision for the restoration obligation recognised.

Revaluations

Fair values for each class of asset are determined as shown below:

Asset class	Fair value measured at
Land and buildings (leasehold improvements)	Depreciated replacement cost
Plant and equipment	Market selling price

Following initial recognition at cost, property, plant and equipment are carried at fair value less subsequent accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets do not differ materially from the assets' fair values as at the reporting date. The regularity of independent valuations depends upon the volatility of movements in market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under the heading of asset revaluation reserve except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised through the operating result. Revaluation decrements for a class of assets are recognised directly through the operating result except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is eliminated against the gross carrying amount of the asset and the asset restated to the revalued amount.

Notes to and forming part of the Financial Statements

Depreciation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives to the Corporation using, in all cases, the straight-line method of depreciation.

Depreciation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

For the reporting period, depreciation rates applying to each class of depreciable asset are based on the following useful lives:

	2009	2008
Leasehold improvements	**Lease term**	Lease term
Plant and equipment	**3 to 8 years**	3 to 8 years

As the Corporation will wind-up on 31 December 2009 the useful lives of all assets have been reviewed and adjusted such that no asset has a useful life of greater than six months at 1 July 2009.

Impairment

All assets were assessed for impairment at 30 June 2009. Where indications of impairment exist an impairment adjustment is made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the Corporation were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

1.15 Intangibles

The Corporation's intangibles comprise externally acquired software and internally developed software for internal use. These assets are carried at cost less accumulated amortisation and accumulated impairment losses.

Software is amortised on a straight-line basis over its anticipated useful life. For the reporting period, the useful lives of the Corporation's software are 3 to 5 years (2007-08: 3 to 5 years). As the Corporation will wind-up on 31 December 2009 the useful lives of all assets have been reviewed and adjusted such that no asset has a useful life of greater than six months at 1 July 2009.

All software assets were assessed for indications of impairment as at 30 June 2009.

1.16 Taxation

The Corporation is exempt from all forms of taxation except fringe benefits tax (FBT) and the Goods and Services Tax (GST).

Revenues, expenses and assets are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

1.17 Comparative Figures

Comparative figures have been adjusted to conform to changes in presentation in the financial report where necessary.

Note 2: Events After the Balance Sheet Date

The Corporation is not aware of any events that have occurred since the balance sheet date which will significantly affect the ongoing structure and financial activities of the Corporation.

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 3: Income		
Revenue		
Note 3A: Revenue from Government		
Department of Agriculture, Fisheries and Forestry		
CAC Act body payment item	**13,018,000**	13,019,000
Note 3B: External contributions		
Related entities	**4,828,922**	20,268,775
External parties	**5,688,802**	4,164,634
Total external contributions	**10,517,724**	24,433,409
Note 3C: Interest		
Deposits	**923,980**	1,157,897
Note 3D: Other revenue		
Conference income	**24,500**	245,131
Publications	**10,018**	2,060
Royalties	**1,237**	3,205
Other	**19,426**	4,365
Total other revenue	**55,181**	254,761

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 4: Expenses		
Note 4A: Employee Benefits		
Wages and salaries	**3,765,818**	4,300,364
Superannuation:		
Defined contribution plans	**235,452**	182,349
Defined benefit plans	**261,006**	338,425
Leave and other entitlements	**242,857**	216,370
Separation and redundancies	**1,071,966**	214,640
Other employee benefits	**16,154**	14,094
Total employee benefits	**5,593,253**	5,266,242

Separation and redundancy costs arise due the Government's decision to wind-up the Corporation. The amount includes costs relating to employees who left on or before 30 June 2009 and a provision for remaining employees who will leave between 1 July 2009 and 31 December 2009.

Note 4B: Suppliers		
Provision of goods - external parties	**237,585**	375,964
Rendering of services - related entities	**442,139**	915,368
Rendering of services - external parties	**6,054,582**	6,534,253
Operating lease rentals - external parties:		
Minimum lease payments	**1,260,332**	478,348
Workers compensation premiums	**23,477**	38,127
Total supplier expenses	**8,018,115**	8,342,060

Minimum lease payments includes a $801,125 provision related to the unavoidable cost of renting office accommodation after 1 July 2009 now surplus to requirements following the Government's decision to wind-up the Corporation.

Note 4C: Depreciation and Amortisation		
Depreciation:		
Plant and equipment	**57,111**	85,524
Leasehold improvements	**214,188**	154,020
Total depreciation	**271,299**	239,544
Amortisation:		
Computer software	**146,806**	149,714
Total depreciation and amortisation	**418,105**	389,258

Note 4D: Write-Down and Impairment of Assets		
Asset write-downs and impairments from:		
Impairment on land and buildings (leasehold improvements)	**72,354**	-
Impairment on plant and equipment	**32,493**	-
Impairment on intangibles	**350,211**	-
Impairment on other non-financial assets	**13,416**	-
Total write-down and impairment of assets	**468,474**	-

The total impairment provision arising due to the Government's decision to wind-up the Corporation is $803,434. $334,960 has been recognised directly in equity during the period and the remaining $468,474 expensed in the income statement.

Note 4E: Losses from Asset Sales		
Plant and equipment:		
Carrying value of assets sold	-	1,625
Total losses from asset sales	-	1,625

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 4F: Research and Development		
Services from external parties	**12,109,019**	20,888,798
Services from related entities	**2,939,337**	3,810,510
Total research and development expenses	**15,048,356**	24,699,308

Note 5: Total Expenses

Total expenses are classified by functional type as follows:

Administration	**5,656,366**	3,198,945
Research and development	**20,812,701**	31,986,005
Portfolio management	**253,030**	48,863
Communication, knowledge and adoption	**2,824,206**	3,464,680
Total expenses	**29,546,303**	38,698,493

Administration expense includes $2,372,304 directly related to the wind-up of the Corporation.

Note 6: Financial Assets

Note 6A: Cash and Cash Equivalents		
Cash on hand or on deposit	**13,260,374**	17,154,179
Total cash and cash equivalents	**13,260,374**	17,154,179
Note 6B: Trade and Other Receivables		
Goods and services - external parties	**479,458**	636,361
Goods and services - related entities	**38,134**	1,120,517
Total receivable for goods and services	**517,592**	1,756,878
GST receivable from the Australian Taxation Office	**435,196**	595,774
Other:		
Interest	**23,753**	56,835
Other receivables	**4,707**	10,634
Total other receivables	**28,460**	67,469
Total trade and other receivables (net)	**981,248**	2,420,121

All receivables are current assets.

Receivables are aged as follows:		
Not overdue	**576,539**	2,386,318
Overdue by:		
Less than 30 days	**149,059**	33,093
30 to 60 days	**159,500**	550
61 to 90 days	**-**	-
More than 90 days	**96,150**	160
Total receivables (gross)	**981,248**	2,420,121

All receivables were reviewed for collectability at balance sheet date and no impairment allowance is necessary.

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 7: Non-Financial Assets		
Note 7A: Land and buildings		
Leasehold improvements:		
Work in progress	**-**	6,149
Fair value	**637,294**	607,700
Accumulated depreciation	**(289,838)**	(75,650)
Accumulated impairment losses	**(320,004)**	-
Total leasehold improvements	**27,452**	538,199
Total land and buildings (non-current)	**27,452**	538,199

An impairment loss of $320,004 on leasehold improvements arises due to the Government's decision to wind-up the Corporation. The recoverable amount for leasehold improvements is stated at its undiscounted value in use. $247,650 of the impairment loss relating to revalued assets has been recognised directly in equity during the period. The remaining $72,354 has been recognised in the income statement for the year (Note 4D).

Note 7B: Plant and equipment		
Plant and equipment:		
Gross carrying value (at fair value)	**208,699**	110,783
Accumulated depreciation	**(57,111)**	-
Accumulated impairment losses	**(119,803)**	-
Total plant and equipment (non-current)	**31,785**	110,783

An impairment loss of $119,803 on plant and equipment arses due to the Government's decision to wind-up the Corporation. The recoverable amount for plant and equipment is stated at its undiscounted value in use. $87,310 of the impairment loss relating to revalued assets has been recognised directly in equity during the period. The remaining $32,493 has been recognised in the income statement for the year (Note 4D).

Notes to and forming part of the Financial Statements

Note 7C: Analysis of property, plant and equipment

TABLE A - ***Reconciliation of the opening and closing balances of property, plant and quipment (2008 - 2009)***

	Buildings - Leasehold Improvements $	Plant and Equipment $	Total $
As at 1 July 2008			
Gross book value	613,849	110,783	**724,632**
Accumulated depreciation and impairment	(75,650)	-	**(75,650)**
Net book value 1 July 2008	538,199	110,783	**648,982**
Additions:			
By purchase	23,445	97,916	**121,361**
Impairments through equity	(247,650)	(87,310)	**(334,960)**
Impairments recognised in the operating result	(72,354)	(32,493)	**(104,847)**
Depreciation expense	(214,188)	(57,111)	**(271,299)**
Net book value 30 June 2009	27,452	31,785	**59,237**
Net book value as of 30 June 2009 represented by:			
Gross book value	637,294	208,699	**845,993**
Accumulated depreciation and impairment	(609,842)	(176,914)	**(786,756)**
	27,452	**31,785**	**59,237**

TABLE A - ***Reconciliation of the opening and closing balances of property, plant and equipment (2007 - 2008*****)**

	Buildings - Leasehold Improvements $	Plant and Equipment $	Total $
As at 1 July 2007			
Gross book value	722,100	349,853	**1,071,953**
Accumulated depreciation and impairment	(189,860)	(209,448)	**(399,308)**
Net book value 1 July 2007	532,240	140,405	**672,645**
Additions:			
By purchase	35,864	42,165	**78,029**
Revaluations through equity	124,115	13,737	**137,852**
Depreciation expense	(154,020)	(85,524)	**(239,544)**
Net book value 30 June 2008	538,199	110,783	**648,982**
Net book value as of 30 June 2008 represented by:			
Gross book value	613,849	110,783	**724,632**
Accumulated depreciation and impairment	(75,650)	-	**(75,650)**
	538,199	**110,783**	**648,982**

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 7D: Intangibles		
Computer software at cost:		
Internally developed - in use	**690,463**	690,463
Accumulated amortisation	**(272,028)**	(134,399)
Accumulated impairment losses	**(349,621)**	-
	68,814	556,064
Externally acquired	**130,773**	130,773
Accumulated amortisation	**(125,594)**	(116,417)
Accumulated impairment losses	**(590)**	-
	4,589	14,356
Total computer software	**73,403**	570,420
Total intangibles (non-current)	**73,403**	570,420

An impairment loss of $350,211 on intangibles arises due to the Government's decision to wind-up the Corporation. The recoverable amount for intangibles is stated at its undiscounted value in use. The impairment loss has been recognised in the income statement for the year (Note 4D).

Notes to and forming part of the Financial Statements

Note 7E: Intangibles (cont)

TABLE A - ***Reconciliation of the opening and closing balances of intangibles (2008 - 2009)***

	Computer software internally developed $	Computer software purchased $	Total $
As at 1 July 2008			
Gross book value	690,463	130,773	821,236
Accumulated amortisation and impairment	(134,399)	(116,417)	(250,816)
Net book value 1 July 2008	556,064	14,356	570,420
Impairments recognised in the operating result	(349,621)	(590)	(350,211)
Amortisation	(137,629)	(9,177)	(146,806)
Net book value 30 June 2009	68,814	4,589	73,403
Net book value as at 30 June 2009 represented by:			
Gross book value	690,463	130,773	821,236
Accumulated amortisation and impairment	(621,649)	(126,184)	(747,833)
	68,814	**4,589**	**73,403**

TABLE A - ***Reconciliation of the opening and closing balances of intangibles (2007 - 2008)***

	Computer software internally developed $	Computer software purchased $	Total $
As at 1 July 2007			
Gross book value	960,050	151,246	1,111,296
Accumulated amortisation and impairment	(329,035)	(122,036)	(451,071)
Net book value 1 July 2007	631,015	29,210	660,225
Additions:			
By purchase or internally developed	57,127	4,407	61,534
Amortisation	(132,078)	(17,636)	(149,714)
Disposals			
Other disposals	-	(1,625)	(1,625)
Net book value 30 June 2008	556,064	14,356	570,420
Net book value as of 30 June 2008 represented by:			
Gross book value	690,463	130,773	821,236
Accumulated amortisation and impairment	(134,399)	(116,417)	(250,816)
	556,064	**14,356**	**570,420**

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 7F: Other Non-Financial Assets		
Prepayments	**30,856**	425,029
Impairments recognised in the operating result	**(13,416)**	-
Total other non-financial assets	**17,440**	425,029

All other non-financial assets are current assets.

An impairment loss of $13,416 on other non-financial assets arises due to the Government's decision to wind-up the Corporation. The recoverable amount for other non-financial assets is stated at its undiscounted value in use. The impairment loss has been recognised in the income statement for the year (Note 4D).

Note 8: Payables

Note 8A: Suppliers		
Trade creditors - external entities	**249,084**	437,537
Total supplier payables	**249,084**	437,537

All supplier payables are current liabilities.

Settlement is usually made net 30 days.

Note 8B: Other Payables		
Suppliers:		
Accrued expenses	**287,634**	476,827
Operating lease incentive	**10,077**	76,626
Research and development:		
Accrued expenses	**1,018,203**	2,745,099
Revenue in advance	**-**	1,134,869
Salaries and wages	**124,359**	285,791
Leave	**271,256**	163,704
Separations	**41,823**	-
Superannuation	**13,850**	9,844
Other	**74,243**	4,351
Total other payables	**1,841,445**	4,897,111

All other payables are current liabilities.

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 9: Provisions		
Note 9A: Employee Provisions		
Separations	**978,010**	-
Leave	**552,677**	548,344
Total employee provisions	**1,530,687**	548,344
Employee provisions are represented by:		
Current	**1,530,687**	399,650
Non-current	**-**	148,694
Total employee provisions	**1,530,687**	548,344

As the Corporation will wind-up on 31 December 2009 all employee provisions are current and will be settled prior to 31 December 2009.

Note 9B: Other Provisions		
Minimum lease payments - surplus space	**801,125**	-
Restoration obligations	**151,559**	160,000
Total other provisions	**952,684**	160,000
Other provisions are represented by:		
Current	**623,873**	-
Non-current	**328,811**	160,000
Total other provisions	**952,684**	160,000

	Minimun Lease Payments - Surplus Space $	Restoration Obligations $	Total $
Carrying amount 1 July 2008	**-**	**160,000**	**160,000**
Unwinding of discount or change in discount rate	**-**	**(8,441)**	**(8,441)**
Additional provision made	**801,125**	**-**	**801,125**
Closing balance 30 June 2009	**801,125**	**151,559**	**952,684**

As a result of the Government's decision to wind-up the Corporation approximately 75% of the Corporation's leased office accomodation space will be surplus to requirements in the period 1 July 2009 to 31 December 2009. After 31 December 2009 100% of any leased office accommodation space will be surplus to requirements. The Corporation has made provision for the full potential unavoidable cost associated with surplus space.

The Corporation currently has an agreement for the leasing of premises which has provisions requiring the Corporation to restore the premises to their original condition at the conclusion of the lease. The Corporation has made a provision for restoration obligations to reflect the present value of this obligation.

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 10: Cash Flow Reconciliation		
Reconciliation of cash and cash equivalents as per balance sheet to cash flow statement		
Report cash and cash equivalent as per:		
Cash flow statement	**13,260,374**	17,154,179
Balance sheet	**13,260,374**	17,154,179
Difference	**-**	-
Reconciliation of operating result to net cash from operating activities:		
Operating result	**(5,031,418)**	166,574
Depreciation / amortisation	**418,105**	389,258
Net write-down of assets	**468,474**	-
Loss from disposal of assets	**-**	1,625
(Increase) / decrease in net receivables	**1,438,873**	(1,079,242)
(Increase) / decrease in prepayments	**394,173**	(376,046)
Increase in employee provisions	**982,343**	107,774
Increase / (decrease) in supplier payables	**(188,453)**	168,695
Increase in minimum lease payments - surplus space provision	**801,125**	-
Increase / (decrease) in other payables	**(3,055,666)**	(1,088,317)
Net cash from / (used by) operating activities	**(3,772,444)**	(1,709,679)

Note 11: Contingent Liabilities and Assets

As at 30 June 2009 there are no quantifiable or unquantifiable contingencies (2008: $nil).

Notes to and forming part of the Financial Statements

Note 12: Directors Remuneration

	2009	2008
The number of directors of the Corporation included in these figures are shown below in the relevant remuneration bands:		
$15 000 to $29 999	**7**	6
$45 000 to $59 999	**1**	1
$210 000 to $224 999	**-**	1
$225 000 to $239 999	**1**	-
Total number of directors of the Corporation	**9**	8
Total remuneration received or due and receivable by directors of the Corporation	**$ 476,324**	$ 420,043

Note 13: Related Party Disclosures

Loans to directors and director-related entities

There were no loans made to directors or director-related entities.

Other transactions with directors or director-related entities

Research and development expenses were paid to the following director-related entities. The directors involved took no part in the relevant decisions of the Board. In the interests of transparency, all transactions with director-related entities are disclosed. These disclosures relate to involvement in honorary, part-time advisory roles with respect to the University of Southern Queensland and CSIRO. With respect to payments to other director-related entities, payments made to these entities were not associated with the areas of responsibility of the relevant directors.

Mrs R Brazil	Chancellor, University of Southern Queensland.
Ms S Starick	Levy Payer, Grains Research and Development Corporation
Prof T Lefroy	Director, Centre for Evironment, University of Tasmania
Mrs D Bentley	Director, Cotton Catchment Communities CRC
Dr N Austin	Executive Director, Agriculture, Biodiversity and Mine Safety, NSW Department of Primary Industries

	2009 $	2008 $
University of Southern Queensland	**267,400**	103,233
NSW Department of Primary Industries	**471,927**	-
Grains Research and Development Corporation	**200,000**	-
CSIRO Land and Water	**-**	831,582
University of Tasmania	**5,000**	177,048
Cotton Catchment Communites CRC	**45,000**	337,593
Total other transactions with directors or director-related entities	**989,327**	1,449,456

Notes to and forming part of the Financial Statements

Note 14: Executive Remuneration

	2009	2008
The number of senior executives who received or were due to receive total remuneration of $130,000 or more:		
$145 000 to $159 999	**-**	1
$160 000 to $174 999	**3**	1
$175 000 to $189 999	**1**	1
Total	**4**	3
The aggregate amount of total remuneration of executives shown above	**$ 695,408**	$ 492,971
The aggregate amount of separation and redundancy/termination benefit paid or accrued during the year for executives shown above	**$ 301,105**	$ -

The executive remuneration includes all senior executives concerned with or taking part in the management of the Corporation during 2008-09 except the Executive Director. Details in relation to the Executive Director have been incorporated into Note 12: Directors Remuneration.

Note 15: Remuneration of Auditors

	2009 $	2008 $
Financial statements audit and other services are provided to the Corporation by the Auditor General.		
The fair value of audit services provided was:		
The Corporation	**31,000**	31,000
The fair value of other services provided was:		
Audit/review of individual Corporation programs or projects	**27,500**	39,500

Notes to and forming part of the Financial Statements

	2009 $	2008 $
Note 16: Financial Instruments		
Note 16A: Categories of financial instruments		
Financial Assets		
Loans and receivables:		
Cash and cash equilvalents	13,260,374	17,154,179
Trade and other receivables (excluding GST receivable)	546,052	1,824,347
Carrying amount of financial assets	13,806,426	18,978,526
Financial Liabilities		
At amortised cost:		
Trade creditors	249,084	437,537
Revenue in advance	-	1,134,869
Carrying amount of financial liabilities	249,084	1,572,406

The carrying amounts of financial assets and financial liabilities are a reasonable approximation of fair value.

Note 16B: Net Income and Expense from Financial Assets		
Loans and receivables		
Interest revenue	923,980	1,157,897
Net gain from financial assets	923,980	1,157,897

Notes to and forming part of the Financial Statements

Note 16C: Credit Risk

The Corporation is exposed to minimal credit risk as the majority of financial assets are cash or cash equivalents. The maximum exposure to credit risk is the risk that arises from potential default of a debtor. This amount is equal to goods and services receivables (2009: $517,592 and 2008: $1,756,878). The Corporation has assessed the risk of the default on payment and $nil (2008: $nil) allowance for impairment is considered necessary.

The Corporation manages its credit risk by undertaking appropriate background and credit checks prior to allowing a debtor relationship. In addition, the Corporation has policies and procedures that guide employees debt recovery techniques that are to be applied.

The Corporation holds no collateral to mitigate against credit risk.

Ageing of financial assets that are past due but not impaired for 2009

	0 to 30 days $	**31 to 60 days $**	**61 to 90 days $**	**90+ days $**	**Total $**
Trade and other receivables	**149,058**	**159,500**	-	**96,150**	**404,708**
Total	**149,058**	**159,500**	-	**96,150**	**404,708**

Ageing of financial assets that are past due but not impaired for 2008

	0 to 30 days $	31 to 60 days $	61 to 90 days $	90+ days $	Total $
Trade and other receivables	33,093	550	-	160	33,803
Total	33,093	550	-	160	33,803

No assets have been individually assessed as impaired.

Notes to and forming part of the Financial Statements

Note 16D: Liquidity Risk

The Corporation's financial liabilities are trade creditors. The exposure to liquidity risk is based on the notion that the Corporation will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to available funds on hand, future Government funding and internal policies and procedures put in place to ensure there are appropriate resources to meet its financial obligations. The Corporation has no past experience of default.

The following tables illustrates the maturities for financial liabilities.

Maturities for financial liabilities 2009

	On demand 2009 $	**Within 1 year 2009 $**	**1 to 2 years 2009 $**	**2 to 5 years 2009 $**	**> 5 years 2009 $**	**Total 2009 $**
Suppliers	-	**249,084**	-	-	-	**249,084**
Total	-	**249,084**	-	-	-	**249,084**

Maturities for financial liabilities 2008

	On demand 2008 $	Within 1 year 2008 $	1 to 2 years 2008 $	1 to 2 years 2008 $	> 5 years 2008 $	Total 2008 $
Suppliers	-	437,537	-	-	-	437,537
Revenue in advance	-	1,134,869	-	-	-	1,134,869
Total	-	1,572,406	-	-	-	1,572,406

Notes to and forming part of the Financial Statements

Note 16E: Market risk

The Corporation holds basic financial instruments that do not expose it to currency risk or other price risk.

Interest Rate Risk

Interest rate risk refers to the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. The Corporation is exposed to interest rate risk primarily from managed funds.

The table below details the interest rate sensitivity analysis of the Corporation at the reporting date, holding all other variables constant. A 75 basis point change is deemed to be a possible change and is used when reporting interest rate risk.

			Effect on	
	Risk variable	**Change in risk variable %**	**Profit and loss 2009 $**	**Equity 2009 $**
Interest rate risk	Interest rate	0.75	99,453	-
Interest rate risk	Interest rate	(0.75)	(99,453)	-

			Effect on	
	Risk variable	Change in risk variable %	Profit and loss 2008 $	Equity 2008 $
Interest rate risk	Interest rate	1.00	167,000	-
Interest rate risk	Interest rate	(1.00)	(167,000)	-

The method used to arrive at the possible change of 75 basis points was based on both statistical and non-statistical analysis. The statistical analysis has been based on the cash rate for the past five years issued by the Reserve Bank of Australia (RBA) as the underlying dataset. This information is then revised and adjusted for reasonableness under the current economic circumstances.

75 basis points is considered reasonable because it is reasonably possible that there will be greater volatility compared to that which has been experienced in recent years, however, not to the extent of the extraordinary volatility experienced in 2008-09.

Notes to and forming part of the Financial Statements

Note 17: Reporting of Outcomes

The Corporation is structured to meet one outcome:

Knowledge, understanding and informed debate to inspire innovation and action in sustainable natural resource management.

Six outputs are identified for this outcome. These are:

Output 1: Landscapes

Output 2: People

Output 3: Industries

Output 4: Innovation

Output 5: Collaborative and Strategic Analysis

Output 6: Knowledge into Practice

Note 17A: Net Cost of Outcome Delivery

	Outcome 1		Not Attributed*		Total	
	2009	2008	**2009**	2008	**2009**	2008
	$	$	**$**	$	**$**	$
Departmental	**27,174,269**	38,698,493	**2,372,034**	-	**29,546,303**	38,698,493
Total expenses	**27,174,269**	38,698,493	**2,372,034**	-	**29,546,303**	38,698,493
Departmental	-	-	-	-	-	-
Total costs recovered	-	-	-	-	-	-
Other external revenues						
External contributions	**10,517,724**	24,433,409	-	-	**10,517,724**	24,433,409
Interest	**923,980**	1,157,897	-	-	**923,980**	1,157,897
Other revenue	**55,181**	254,761	-	-	**55,181**	254,761
Departmental	***11,496,885***	*25,846,067*	-	-	***11,496,885***	*25,846,067*
Total other external revenues	**11,496,885**	25,846,067	-	-	**11,496,885**	25,846,067
Net cost of outcome	**15,677,384**	12,852,426	**2,372,034**	-	**18,049,418**	12,852,426

* Not attributed expenses are expenses and provisions through the income statement which directly relate to the wind-up of the Corporation. These expenses do not contribute to meeting the Corporation's outcome. They are included here so the total can agree to the resourcing table.

All departmental assets and liabilities are attributable to the Corporation's single outcome.

Notes to and forming part of the Financial Statements

Note 17B: Major Classes of Departmental Income and Expenses by Output Groups and Outputs

Outcome 1	Output Group 1		Output Group 2		Output Group 3	
	Output 1.1.1		Output 1.2.1		Output 1.3.1	
	2009	2008	**2009**	2008	**2009**	2008
	$	$	**$**	$	**$**	$
Departmental expenses						
Employees	**952,590**	797,784	**365,377**	258,805	**1,071,850**	1,237,108
Suppliers	**1,659,401**	901,928	**589,102**	291,177	**2,029,397**	3,142,886
Research and development	**8,488,375**	9,803,588	**776,330**	585,619	**3,807,094**	7,811,193
Depreciation and amortisation	**172,981**	115,529	**26,972**	11,405	**107,934**	122,999
Loss from disposal of assets	**-**	488	**-**	48	**-**	517
Total departmental expenses	**11,273,347**	11,619,317	**1,757,781**	1,147,054	**7,016,275**	12,314,703
Funded by:						
Departmental income						
Income from Government	**3,598,629**	4,021,751	**1,232,840**	1,062,227	**2,158,711**	2,914,889
External contributions	**4,664,510**	6,555,660	**400,000**	960,000	**4,953,894**	8,880,659
Interest	**289,274**	444,694	**57,535**	2,217	**507,059**	503,526
Other income	**38,278**	7,694	**-**	-	**5,854**	250,293
Total departmental income	**8,590,691**	11,029,799	**1,690,375**	2,024,444	**7,625,518**	12,549,367

Notes to and forming part of the Financial Statements

Outcome 1	Output Group 4		Output Group 5		Output Group 6		Outcome 1 Total	
	Output 1.4.1		Output 1.5.1		Output 1.6.1			
	2009	2008	**2009**	2008	**2009**	2008	**2009**	2008
	$	$	**$**	$	**$**	$	**$**	$
Departmental expenses								
Employees	**364,373**	211,667	**500,617**	1,270,847	**1,266,480**	1,490,031	**4,521,287**	5,266,242
Suppliers	**371,302**	159,734	**710,513**	1,728,795	**1,826,806**	2,117,540	**7,186,521**	8,342,060
Research and development	**1,835,193**	1,587,424	**71,970**	4,780,934	**69,394**	130,550	**15,048,356**	24,699,308
Depreciation and amortisation	**40,062**	19,673	**20,363**	81,046	**49,793**	38,606	**418,105**	389,258
Loss from disposal of assets	**-**	83	**-**	330	**-**	159	**-**	1,625
Total departmental expenses	**2,610,930**	1,978,581	**1,303,463**	7,861,952	**3,212,473**	3,776,886	**27,174,269**	38,698,493
Funded by:								
Departmental income								
Income from Government	**3,271,581**	2,362,370	**757,742**	853,932	**1,998,497**	1,803,831	**13,018,000**	13,019,000
External contributions	**-**	-	**(5,710)**	6,161,823	**505,030**	1,875,267	**10,517,724**	24,433,409
Interest	**-**	-	**26,858**	139,835	**43,254**	67,625	**923,980**	1,157,897
Other income	**-**	-	**-**	(3,226)	**11,049**	-	**55,181**	254,761
Total departmental income	**3,271,581**	2,362,370	**778,890**	7,152,364	**2,557,830**	3,746,723	**24,514,885**	38,865,067

Administration income and expenditure (excluding the unattributed component) has been allocated across outputs, proportionally, based on output income and expenditure. The net costs shown include intra-government costs that are eliminated in calculating the actual Budget outcome.

4. Appendices

Appendix 1—Research projects active during 2008–09

Innovation Program

Innovation Call

Project title	Research provider	Status
A rapid genetic approach for assessing sediment biodiversity and functioning	CSIRO Entomology	To be transferred to a new managing agency
Changing the ownership-management paradigm in broadacre farming	University of Western Australia	Managed to completion by LWA if timely
Characterising southwest Australia's rainfall variability using speleothems and climate models	Australian National University	Completed May 2009
Characterising the effects of river regulation on longitudinal trophic pathways	Department of Water and Energy NSW	Notice of termination given
Climate Witness—a dispersed, national observer network for NRM phenology	Earthwatch Institute	To be transferred to a new managing agency
Dynamic non market valuation of ecosystem services	University of WA	Completed June 2009
Dynamics of sediment and nutrient fluxes from burnt forest catchments	Department of Sustainability and Environment, Vic	Completed
Empowering land managers with wireless soil monitoring	CSIRO Land and Water	Notice of termination given
Exploiting Australia's Isoscape: novel methodology to underpin climate change modelling	CSIRO Sustainable Ecosystems	Completed

Innovation Call

Project title	Research provider	Status
Frogs as bioindicators for chemical use in irrigation-based agriculture	Department of Environment and Conservation NSW	Completed February 2009
Healthy catchments through detection and remediation of contaminants with novel technologies	RMIT	Completed June 2009
Irrigation futures for the Murray	CSIRO Land and Water	Managed to completion by LWA if timely
Modelling impacts of vegetation cover change on regional climate	University of Queensland	Completed
Oil vulnerability in peri-urban and rural Australia	Griffith University	To be transferred to a new managing agency
Sustainability of freshwater lenses under major rivers	University of Melbourne	Completed May 2009
The recent Western Victorian drought and its impact: without precedent?	University of Ballarat	To be transferred to a new managing agency
Transition to a biofuel economy in Australia	CSIRO Sustainable Ecosystems	Completed June 2009
Treated effluent as environmental flows: a climate change response	CSIRO	To be transferred to a new managing agency
Understanding multiple human impacts on stream flow regimes	University of Melbourne	Notice of termination given
Use of Bayesian decision-support tools in sustainable management	Monash University	Completed June 2009

Senior Research Fellows

Project title	Research provider	Status
A new charter for exploring Australia's 'hidden' natural resource, the soil biota	Department of Primary Industries Victoria	Final report submitted
Integrating agricultural production and biodiversity conservation	Australian National University	Converted to grant to be managed by host university
Land & Water Australia International Fellow	Dr Larry Barber	Completed 2009
Linking plant evaporative demand and pan evaporation	Australian National University	Converted to grant to be managed by host university
The ecohydrology of Australian landscapes: an analysis and synthesis	University of Technology Sydney	Completed June 2009
The scientist's garden: reflections on food and water	CSIRO Land and Water	Completed June 2009
What's around the bend for the Murray-Darling Basin river system? Implications of climate and resource management change for the state of the Basin's river ecosystems	Freshwater Systems, Tasmania	Completed

Postgraduate Research Projects

Project title	Research provider	Status
A spatial dynamic framework to integrate regional water use efficiency and energy consumption nexus	Charles Sturt University	Converted to grant to be managed by host university
Applying justice frameworks to environmental decision-making	Australian National University	Converted to grant to be managed by host university
Cross-tenure landscape management: integrating multiple values and institutions	Australian National University	Converted to grant to be managed by host university
Ecosystem services from grasslands—effects on tree regeneration processes	Charles Sturt University	Converted to grant to be managed by host university
Ecosystem services: a concept linking management actions and ecosystem outcomes	University of Technology Sydney	Converted to grant to be managed by host university
Effects of river flows on downstream productivity in tropical rivers	Griffith University	Converted to grant to be managed by host university
Fire regimes and biodiversity conservation in the Murray Mallee	Deakin University	Converted to grant to be managed by host university
Flooding tolerance of plants in Australian wetland ecosystems	The University of Western Australia	Converted to grant to be managed by host university
Function and resilience of box woodland and related floodplain systems in agricultural landscapes	University of Southern Qld	Converted to grant to be managed by host university
How do floodplain habitats support fish biodiversity in tropical rivers?	Griffith University	Converted to grant to be managed by host university
If you build it, will they come? Reptile recolonisation following plant community restoration	University of Western Australia	Converted to grant to be managed by host university
Impact of chemicals used in irrigation agriculture on macro invertebrate biodiversity	Macquarie University	Converted to grant to be managed by host university

Postgraduate Research Projects

Project title	Research provider	Status
Interactive effects of salinity and water regime on ecologically significant water plants	Monash University	Completed June 2009
Investigating adoption processes for sustainable farming practice: Potter Project case study	RMIT	Converted to grant to be managed by host university
Maximising woodland bird diversity in Brigalow Belt forests	University of Queensland	Converted to grant to be managed by host university
Optimising river flow management for environmental and economic sustainability	University of New England	Converted to grant to be managed by host university
Quantifying acid and trace metal fluxes in aquifers under anthropogenic influence	Flinders University	Converted to grant to be managed by host university
Salinity processes in Lake Eyre Basin Rivers	University of Melbourne	Converted to grant to be managed by host university
Sustainable management of connected water resources: robbing Peter to pay Paul	Australian National University	Converted to grant to be managed by host university
Water and catchment planning: incorporating demography and population	Australian National University	Converted to grant to be managed by host university

Social and Institutional Research Program

Project title	Research provider	Status
Adaptive agriculture NRM stock-take	Kiri-Ganai Consulting	Completed May 2009
An agreement-based approach to customary law governance in water resource management	Macquarie University	Completed January 2009
Australian NRM practitioners and ecosystem services stocktake	University of Technology Sydney	Completed March 2009
Change and continuity in peri-urban Australia: scenarios and strategies for sustainability	RMIT	Completed October 2008
Developing institutional arrangements for Indigenous participation in the National Water Initiative	Tropical Savannas CRC	Completed July 2008
Development of Indigenous knowledge capacity across north Australia	Tropical Savannas CRC	Completed September 2008
Identifying and characterising the social assets of the natural resource management system	Environment & Behaviour Consultants	Completed August 2008
Identifying and characterising the social assets of the natural resource management system—Mapping the spatial footprint of Australian agricultural industries	Australian Bureau of Statistics	Completed December 2008
Improving NRM program and project design, implementation and evaluation	Ms Arianne Lowe, ANU	Completed December 2008
Investing in natural resource management practice change	Hassall and Associates Pty Ltd	To be transferred to a new managing agency
Monitoring and evaluating the social and institutional research program	Su Wild River	Completed
Pathways to good practice in regional NRM governance	University of Tasmania	Completed May 2009
Regional NRM stock-take	Robins Consulting	Completed May 2009

Social and Institutional Research Program

Project title	Research provider	Status
Socio-economic and institutional water research and developing mapping and analysis	Inovact Consulting	Completed May 2009
The regulation of Indigenous rights through environmental legislation	ANU	Completed July 2008
Transformational change for resilient landscapes and communities, scoping study	Rod Griffith & Associates	Completed May 2009
Water planning: lessons, gaps and adoption —an NWC funded project	Griffith University	Completed

Climate Change Research Strategy for Primary Industries Program

Project title	Research provider	Status
The implications of greenhouse mitigation policies on the demand for agricultural land	AFI	To be transferred to a new managing agency

Managing Climate Variability Program

Project title	Research provider	Status
Assessing and managing heat stress in cereals	SARDI	Tranferred to Grains Research and Development Corporation (GRDC)
Audit of climate risk management tools	Managing Climate Variability	Completed
Building effective climate risk management in the WA grain belt	Department of Agriculture, Western Australia	Completed in 2008
Climate change and variability: assessing regional impacts of sugar cane production	Reef Catchments	Transferred to GRDC
Critical thresholds ('tipping points') and climate change impacts/adaptation in horticulture	Queensland Primary Industries and Fisheries	Transferred to GRDC

Managing Climate Variability Program

Project title	Research provider	Status
Enabling natural resource decision-makers to make better use of climate science	SARDI	Completed 2008
Extremes, climate models and reanalysis-based approaches to agricultural resilience	University of Southern Queensland	To be transferred to GRDC
Farmers applying seasonal climate forecasting for profitable sustainable resource use	University of Sydney	Completed
Growing capacity in seasonal climate risk management in south-east Australia	DPI Victoria	Completed 2008
Improved seasonal climate forecast information on the internet	Bureau of Meteorology	Completed 2009
Improving prediction of the northern Australian wet season	Department of Natural Resources & Water, Queensland	Completed 2008
Improving seasonal forecasts for south-west Western Australia	CSIRO	Transferred to GRDC
Integration of climate-related decision-support system tools to improve their relevance	CSIRO Sustainable Ecosystems	Completed June 2009
Scoping northern Australian seasonal climate knowledge R&D initiative	University of Southern Queensland	Completed 2009
Seasonal forecasting for eastern Australia scoping study	University of Southern Queensland	Completed 2009
South-east Australia climate initiative	Murray-Darling Basin Commission, Department of Primary Industries Victoria and other collaborators	Completed 2009

National Program for Sustainable Irrigation

Project title	Research provider	Status
Adaptive learning through five strands of root-zone knowledge	CRC for Irrigation Futures	To be transferred to Cotton Research and Development Corporation (CRDC)
Channel evaporation mitigation	Goulburn-Murray Water	To be transferred to CRDC
Developing design criteria for tailwater input for wetland systems in the Burdekin River Irrigation Area—Student scholarship	James Cook University	To be transferred to CRDC
Farm dam management	CRC for Irrigation Futures	To be transferred to CRDC
Impact of minimal vineyard irrigation—PhD	University of Southern Queensland	To be transferred to CRDC
Increasing the resilience of eastern Australian irrigated farm businesses	DPI Qld	To be transferred to CRDC
Informing future irrigation and water management at the Ord, WA	Brolga's Environment	Completed
Knowledge and tools to manage fertigation technologies in highly productive citrus orchards for minimal environmental footprint	NSW DPI	To be transferred to CRDC
NPSI Knowledge harvest	Peter Day Resource Strategies	To be transferred to CRDC
Lake Tutchewop—student scholarship	RMIT	Completed 2008
Long term sustainability of precision irrigation	University of Adelaide	To be transferred to CRDC
Management of irrigation water storages: carryover rights and capacity sharing	ABARE	To be transferred to CRDC
Managing soil salinity for wine quality in groundwater-irrigated vineyards	PIRSA-SARDI	To be transferred to CRDC

National Program for Sustainable Irrigation

Project title	Research provider	Status
Monitoring aqueous root zone conditions under irrigated cotton and grains crops—student scholarship	University of Sydney	Completed June 2009
NPSI Phase 2 monitoring and evaluation	QualData	To be transferred to CRDC
NPSI/IAL Travelling Fellowship	Irrigation Australia Ltd	To be transferred to CRDC
Open hydroponics irrigation in citrus	SARDI	To be transferred to CRDC
Optimising delivery and benefits of aerated irrigation water	Centre for Plant & Water Science, CQU	To be transferred to CRDC
Quantifying surface water and groundwater exchange using thermal and chemical measurements	Water Research Lab, University of NSW	To be transferred to CRDC
Review of precision irrigation technologies and their application	University of Southern Queensland	To be transferred to CRDC
Root zone water, salinity and nutrient management	SARDI	To be transferred to CRDC
Soil management for Australian irrigated agriculture	Soils Research Pty Ltd	To be transferred to CRDC
The effect of changing irrigation strategies on biodiversity	CSIRO Sustainable Ecosystems	To be transferred to CRDC
The effect of irrigation management on nitrate movement under a lettuce crop—Student scholarship	University of Southern Queensland	To be transferred to CRDC
The partitioning of almond evapotranspiration into soil water evaporation and crop transpiration—student scholarship	Flinders University	Completed 2009
Water smart cotton and grains in NSW	NSW DPI	To be transferred to CRDC

Defeating the Weed Menace Program

Project title	Research provider	Status
Assessing end-user needs of a national information system for weeds	Mr Chris Auricht, NRM Information Systems Consultant	Completed May 2009
Best practice for weed detection	University of New England	Completed September 2008
Biological control and ecology of Alligator weed	CSIRO	Completed September 2008
Boneseed rust. A promising candidate for biological control.	CSIRO	Completed September 2008
Cost-effective surveillance of emerging aquatic weeds using robotic aircraft	University of Sydney	Completed September 2008
Developing a model for environmental weed management in fragmented landscapes	Dept of Environment & Heritage SA	Completed September 2008
Ecological, economic and social considerations of spray control for *Hymenachne*	Central Queensland University	Completed September 2008
Effects of land use and peri-urban development on aquatic weeds	CSIRO	Completed September 2008
Elucidating relationships between distribution and invasion in riparian zones	Department of Primary Industries, Victoria	Completed September 2008
Enhancing Noogoora Burr bio-control in the Northern Territory	CSIRO	Completed September 2008
Evaluating the environmental benefits arising from managing weeds of national significance in natural ecosystems	CSIRO	Completed September 2008
Exploring agents of change to peri-urban weed management	Upper Murrumbidgee Catchment Coordinating Committee	Completed September 2008
Importation and release of a new biological control agent for Scotch Broom	Department of Primary Industries, Victoria	Completed September 2008
Importation, rearing and field release of the Cape Broom psyllid	SA Research and Development Institute	Completed September 2008

Defeating the Weed Menace Program

Project title	Research provider	Status
Improving management of *Salvinia* in temperate aquatic ecosystems	University of Wollongong	Completed September 2008
Improving targeting of weed biological control projects in Australia	Landcare Research New Zealand	Completed May 2009
Land-use effects on soil nutrient enrichment: Risks for weed invasion	CSIRO	Completed September 2008
Managing weeds under future scenarios for environmental flows in the Murray River	CSIRO	Completed September 2008
Modelling climate change impacts on sleeper and alert weeds	CSIRO	Completed September 2008
New biological control agents for *Parkinsonia*	CSIRO	Completed September 2008
Optimising management of core mesquite infestations across Australia	CSIRO	Completed September 2008
Pathway risk analysis for weed spread in Australia	University of New England	Completed September 2008
Pinus radiata in bushland. Assessing the issue in the Green Triangle.	Dept of Environment & Heritage SA	Completed September 2008
Quantification of the environmental and control costs of weeds	Charles Darwin University	Completed September 2008
Quantifying costs and benefits of Buffel grass	CSIRO	Completed September 2008
Serrated tussock. Managing native pastures to prevent invasion.	Charles Sturt University	Completed September 2008
Understanding and determining mechanisms to prevent invasion in coastal vegetation	University of Wollongong	Completed September 2008

Environmental Water Allocation Program

Project title	Research provider	Status
Adaptive management of environmental flows in the regulated Macquarie River	University of NSW	Managed to completion by LWA if timely
Environmental water allocations required to sustain macroinvertebrate species in ephemeral streams	Deakin University	Completed June 2009
EWA Mid-term review & EW research mapping	Lloyd Environmental Pty Ltd	Completed
Flow requirements and resource delivery to the lower Murray lakes and northern Coorong	University of Adelaide	Completed
Flows and aquatic plants: an historical and experimental approach	University of Melbourne	Notice of termination given
Water allocation to River Murray wetlands: a basin-wide modelling approach	University of Adelaide	Managed to completion by LWA if timely
Water regime dependence of fish in the wet-dry tropics	Charles Darwin University	Completed June 2009
With the wisdom of hindsight: reconsidering institutional arrangements for water	University of Adelaide	Completed

DEWHA funded projects

Project title	Research provider	Status
Australian water entitlements	Webb McKeown and Associates	Completed March 2008
Development of a classification system for high conservation value aquatic ecosystems	Mr Chris Auricht	Completed February 2009
Managed aquifer recharge—risks to groundwater dependent ecosystems: a review	CSIRO	Completed June 2009
National assessment of river and wetland health business case and indicators	Edgar & Partners	Completed December 2008

Joint Venture Agroforestry Program

As RIRDC are managers of the Joint Venture Agroforestry Program, and Land & Water Australia's commitment to the program ended 30 June 2009, what follows is a list of projects which Land & Water Australia jointly funded over the 2008–09 year. Those projects marked with * will continue to be funded by the *Joint Venture Agroforestry Program* and managed by RIRDC to their completion.

Project title	Research provider	Status
A revised private native forestry metric to assess forest structural change	Dr Ross Peacock	Completed 2008
Australian Forest Growers 2008 Conference Albury Wodonga October 2008	Conference Sponsorship	Completed 2008
Assessing the extent ecological condition wood values and other tangible and intangible forest values of privately owned dry schlerophyll forests	John Field	Completed 2008
Australian Master TreeGrower: Building capacity for integrated vegetation management	Rowan Reid, University of Melbourne	Completed 2009
Catchment scale evaluation of trees, water & salt	Richard Harper, Forest Products Commission, Western Australia	Completed 2008
Communicating sustainable forest management for the private forest (NHT)	David Fisken	Completed 2008

Joint Venture Agroforestry Program

Project title	Research provider	Status
Competitiveness of *Acacia saligna* in alleys; root morphology and physiology	Robert Sudmeyer, Department Agriculture, Western Australia	Due for completion November 2009*
Farm trees: enhancing biodiversity nature conservation and natural pest co	Geoff Gurr	Completed 2008
FloraSearch (stage 3)	Mike Bennell	Completed 2008
Genetic improvement for naturally durable hardwood posts	David Bush	Completed 2008
Green ants as biological control agents in agroforestry	Keith Christian, Charles Darwin University	Completed 2009
Hydrological impacts and productivity interactions of integrated oil-mallee farming systems	Kim Brooksbank, Department of Agriculture, Western Australia	Due for completion November 2009*
Improved direct seeding establishment of commercial native plants through improved germination, moisture management and weed control	Geoff Woodall, Future Farm Industries CRC and Centre for Excellence in Natural Resource Management	Completed 2009
Improving economics of small-scale farm forestry processing for grower groups	Andrew Lang	Completed 2009
JVAP Highlights Report	John Powell	Completed 2009
Large-scale research investments for best practice farm forestry and vegetation	Prof. David Lindenmayer, Australian National University	Completed 2008
Multi-purpose 'healthy' grazing systems using perennial shrubs	Dean Revell, CSIRO	Completed 2008
Prioritisation of regional opportunities for agroforestry investment (NHT)	Dr Philip Polglase	Completed 2008

Joint Venture Agroforestry Program

Project title	Research provider	Status
Productivity of mallee agroforestry systems with various competition management regimes	Adam Peck, Department of Agriculture, Western Australia	Due for completion March 2011*
Review of JVAP 2004–09 and development of a future five year plan	Mark Stickells	Completed 2009
Role of plantings in maintaining reptile diversity in rural landscapes—travel grant	Frank Lemckert	Completed 2008
The bio-economic potential for agroforestry in northern cattle grazing systems	Michael Stephens, CSIRO	Completed 2008
The role, values and potential of private native forestry	Mark Parsons	Completed 2008

Native Vegetation and Biodiversity Program

Project title	Research provider	Status
Achieving coordinated landscape-scale outcomes with auction mechanisms	CSIRO	Completed December 2008
Assessing biodiversity outcomes from water point management in the arid rangelands	CSIRO Sustainable Ecosystems	Completed June 2009
Capturing the pest control services of native vegetation	Cotton Catchment Communities Cooperative Research Centre	Managed to completion by LWA if timely
Defining succession patterns and biodiversity values of Top End eucalypt forests	Tropical Savannas CRC	Completed April 2009
Designing agricultural landscapes in the monsoon tropics to maintain biodiversity and ecosystem services	Tropical Savannas CRC	Managed to completion by LWA if timely
Determining appropriate fire mosaics for biodiversity conservation in Mallee ecosystems	La Trobe University	Managed to completion by LWA if timely

Native Vegetation and Biodiversity Program

Project title	Research provider	Status
Harvesting general principles from research to improve the effectiveness and uptake of conservation strategies and actions	Australian National University	Completed June 2009
The fourth dimension: incorporating time into landscape-level biodiversity assessments	Deakin University	Completed June 2009
Linking biodiversity benefits to management actions on conservation reserves	Australian Bush Heritage Fund	Completed June 2009
Biodiversity values and functional ecology of regrowth vegetation	Environmental Protection Agency	Completed June 2009
Understanding factors affecting bird diversity in sub-tropical woodlands	University of Southern Queensland	Completed December 2008
Understanding genetic constraints to vegetation persistence in fragmented landscapes	CSIRO Plant Industry	Completed June 2009
Mastering vegetation management for both conservation and profit	University of Melbourne	Completed June 2009
Fire management in Northern Australia: integrating ecological, economic and social outcomes	Tropical Savannas CRC	Managed to completion by LWA if timely
Enhancing and utilising landscape heterogeneity to meet multiple ecosystem objectives	CSIRO Sustainable Ecosystems	Completed
Systematic review of landscape connectivity in Australia	CSIRO Sustainable Ecosystems	Completed June 2009
Do managed grazed lands contribute to conservation of plant diversity in Australian temperate grassy eucalypt woodland? A systematic review.	A and J Dorrough	Completed June 2009

Tropical Rivers and Coastal Knowledge Program

Project title	Research provider	Status
Bedload transport in large tropical rivers and effects on dry season pool habitats	Griffith University	To be transferred to a new managing agency
Biophysical classification of riverscapes across northern Australia	Griffith University	To be transferred to a new managing agency
Bio-regionalisation, conservation priorities and predictive models of aquatic biodiversity	Griffith University	To be transferred to a new managing agency
Bottom-up and top-down control of riverine food webs	Charles Darwin University	To be transferred to a new managing agency
Capacity building tools for effective planning and decision-making in Indigenous contexts	Charles Darwin University	To be transferred to a new managing agency
Catchment water budgets and water resource assessment	CSIRO	To be transferred to a new managing agency
Development of planning tools	Griffith University	To be transferred to a new managing agency
Ecohydrological regionalisation of Australia	Griffith University	Completed December 2008
Effects of urbanisation and catchment development on ecosystem health in estuaries	Griffith University	To be transferred to a new managing agency
Environmental flow tools for northern rivers	University of Western Australia	To be transferred to a new managing agency
Flow and ecology relationships; biodiversity and ecosystem processes	University of Western Australia	To be transferred to a new managing agency
Flow impacts on estuarine fin fish of the Gulf of Carpentaria	Qld Department of Primary Industries and Fisheries	To be transferred to a new managing agency
Impacts of land management on productivity in the Daly and Flinders rivers	CSIRO	To be transferred to a new managing agency
Indigenous values and river flows	CSIRO	To be transferred to a new managing agency
Refugial pools in tropical rivers	Griffith University	To be transferred to a new managing agency

Tropical Rivers and Coastal Knowledge Program

Project title	Research provider	Status
Regional scale sediment and nutrient budgets	CSIRO	To be transferred to a new managing agency
River flood plain food webs	Griffith University	To be transferred to a new managing agency
Scenarios for tropical rivers and coasts	Charles Darwin University	To be transferred to a new managing agency
Socio-economic activity and water use in the tropical rivers region	James Cook University	To be transferred to a new managing agency
Sustainable economic development in northern riverine and coastal environments	North Australia Indigenous Land and Sea Management Alliance	To be transferred to a new managing agency
TRaCK integration, knowledge and adoption	Charles Darwin University	To be transferred to a new managing agency
Valuing and managing the ecosystem services of tropical river systems	CSIRO Sustainable Ecosystems	Completed June 2009
Monitoring riparian zone vegetation change using remote sensing	Griffith University	Managed to completion by LWA if timely
Gully erosion in the Gulf Plains (005176)	Griffith University	Managed to completion by LWA if timely

Legacy activity

Grain & Graze Program

Project title	Research provider	Status
Grain & Graze Regional Initiative: Central West-Lachlan	NSW Department of Primary Industries	Managed to completion by LWA if timely
Grain & Graze Regional Initiative: Mallee	Mallee Sustainable Farming	Completed November 2008

Healthy Soils for Sustainable Farms Program

Project title	Research provider	Status
Component of the Victorian HSSF project	Mallee Sustainable Farming Inc.	Completed
Component of the Victorian HSSF project	Birchip Cropping Group	Completed
Improving soil health in Western Australian farming systems	University of Western Australia	Completed 2009
Soil health—Leaving a legacy for south-eastern Australia	Department of Primary Industries Victoria	Completed 2008
Sustainable farming practices in the Mid-Loddon catchment	Mid-Loddon Sub-catchment Management Group	Completed 2008
Sustainable soil management workshops for Queensland broadacre cropping industries	Queensland Department of Primary Industries and Fisheries	Completed 2008
Soil Health Knowledge Bank	Land & Water Australia	Completed 2009

Appendix 2—Glossary of abbreviations and acronyms

Table of abbreviations and acronyms used in the document

Abbreviation/ acronym	In full
AANRO	Australian Agriculture Natural Resources Online
AARES	Australian Agriculture and Resource Economics Society
AASB	Australian Accounting Standards Board
ABARE	Australian Bureau of Agricultural and Resource Economics
ABOA	Australian Bibliography of Agriculture
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
actKM	Australian Capital Territory Knowledge Management
AECL	Australian Egg Corporation Limited
AFG	Australian Forest Growers
AFI	Australian Farm Institute
ALRTIG	Australian Low Rainfall Tree Improvement Group

Abbreviation/ acronym	In full
ANR Atlas	Australian Natural Resources Atlas
ANRDL	Australian Natural Resources Data Library
ANU	The Australian National University
ANZLIC	The Spatial Information Council of Australia and New Zealand (formerly known as the Australia New Zealand Land Information Council)
AOP	Annual Operational Plan
APSIM	Agricultural Production Systems Simulator
ARRIP	Australian Agricultural Research in Progress
AussieGRASS	Australian Grassland and Rangeland Assessment by Spatial Simulation
AWI	Australian Wool Innovation Limited
BOM	Bureau of Meteorology
CAC Act	Commonwealth Authorities and Companies Act 1997

Abbreviation/ acronym	In full
CCRSPI	Climate Change Research Strategy for Primary Industries
CERF	Commonwealth Environment Research Facilities Program
CLLAMM	Coorong, Lower Lakes and Murray Mouth
CMA	Catchment Management Authority
CQU	Central Queensland University
CRC	Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSS	Commonwealth Superannuation Scheme
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
DCC	Australian Government Department of Climate Change
Dept	Department
DEWHA	Australian Government Department of Environment, Water, Heritage and the Arts

Abbreviation/ acronym	In full
DNA	deoxyribonucleic acid
DPI	Department of Primary Industries
DRMAC	Daly River Management Advisory Committee
DSS	decision-support system
DWM	Defeating the Weed Menace
EAP	Employee Assistance Program
EDCs	Endocrine Disrupting Chemicals
EOI	Expression of Interest
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ETS	Emissions Trading Scheme
EWA	Environmental Water Allocation
FBT	Fringe Benefits Tax
FMO	Finance Minister's Orders
FOI Act	Freedom of Information
FTE	full-time equivalent

Abbreviation/ acronym	In full
GA	Greening Australia
GIS	geographic information system
GRDC	Grains Research & Development Corporation
GST	goods and services tax
Hon	Honourable
HSSF	Healthy Soils for Sustainable Farms
IAHS	International Association of Hydrological Sciences
IAL	Irrigation Australia Limited
JVAP	Joint Venture Agroforesty Program
K&A	Knowledge and Adoption
KPI	key performance indicator
LOESS	Locally estimated scatterplot smoothing
LWA	Land & Water Australia
MBI	Market-based instrument

Abbreviation/ acronym	In full
MCV	Managing Climate Variability
MDBA	Murray-Darling Basin Authority
MLA	Meat & Livestock Australia Limited
MP	Member of Parliament
Mt	Mount
MTG	Master TreeGrowers
NAILSMA	North Australia Indigenous Land and Sea Management Alliance
NAMS	National Agricultural Monitoring System
NCCARF	National Climate Change Adaptation Research Facility
NFF	National Farmers' Federation
NGO	non-government organisation
NHT	Natural Heritage Trust
NLWRA	National Land and Water Resources Audit
NPSI	National Program for Sustainable Irrigation

Abbreviation/ acronym	In full
NRM	Natural Resource Management
NSW	New South Wales
NT	Northern Territory
NVB	Native Vegetation and Biodiversity
NWC	National Water Commission
OH&S	Occupational Health and Safety
OzECCO	The OzECCO Embodied Energy Model of Australia's Physical Economy/Function
PI ARN	Primary Industry Adaptation Research Network
PIERD Act	Primary Industries Research and Development Act 1989
PIRSA	Department of Primary Industries and Resources of South Australia
PMC	Project management committee
PNAS	Proceedings of the National Academy of Sciences of the United States of America

Abbreviation/ acronym	In full
POAMA	Predictive Ocean Atmosphere Model for Australia
pp	pages
PSS	Public Sector Superannuation Scheme
Qld	Queensland
QUT	Queensland University of Technology
R&D	research and development
RBA	Reserve Bank of Australia
RDC	Research and Development Corporation
REC	Research Executive Committee
RIPA	Regional Industry Potential Analysis
RIRDC	Rural Industries Research and Development Corporation
RKRK	Regional Knowledge Resource Kit
RMIT	Royal Melbourne Institute of Technology
ROI	return-on-investment

Abbreviation/ acronym	In full
ROO Schedule	Report of Operations Schedule
SA	South Australia
SARDI	South Australian Research & Development Institutional
SE	south-eastern
SIRP	Social and Institutional Research Program
SRDC	Sugar Research and Development Corporation
TRaCK	Tropical Rivers and Coastal Knowledge program
UQ	University of Queensland
UWA	University of Western Australia
Vic	Victoria
WA	Western Australia
WATL	BOM Water and the Land website
WoNS	Weeds of National Significance
WWF	World Wide Fund For Nature

Appendix 3—Publications listing

Innovation Program

Bammer G 2008, *Improving integration in NRM: learning from health, security and innovation* (in prep)

Brunckhorst D & Morley P 2008, *Alternative landscape futures: understanding alternate landscape design options for planning more sustainable regions*, final report [online] lwa.gov.au/products/pn30069

Eamus D 2009, *Climate change and water use of native vegetation*, fact sheet [online] lwa.gov.au/products/pn30134

Eamus D 2009, *Identifying groundwater dependent ecosystems*, fact sheet [online] lwa.gov.au/products/pn30129

Eamus D 2009, *The impacts of plantation age, fire and disturbance on catchment water yield*, fact sheet [online] lwa.gov.au/products/pn30130

Foran B 2009, *Powerful choices: transition to a biofuel economy in Australia*, final report [online] lwa.gov.au/products/pn30178

Hacker J 2009, *Advanced airborne technologies for mapping and monitoring native Australian vegetation*, final report [online] lwa.gov.au/products/pn22593

Hart B, Shenton W and Chan T 2009, *Bayesian network models for environmental flow decision-making*, final report [online] lwa.gov.au/products/pn30155

Hertzler G 2009, *Dynamic non-market valuation of ecosystem services*, final report [online] lwa.gov.au/products/pn30153

Hobbs RJ & Allison HE 2009, *New paradigms to find solutions to intractable NRM problems*, final report [online] lwa.gov.au/products/pn22229

Hyne R, Wilson S and Byrne M 2009, *Frogs as bioindicators of chemical usage and farm practices in an irrigated agricultural area*, final report [online] lwa.gov.au/products/pn30152

Jensen A 2008, *The roles of seedbanks and soil moisture in recruitment of semi-arid floodplain plants: the River Murray Australia*, PhD thesis, University of Adelaide

Jensen A 2009, *Making the most of scant environmental flows: maintaining the river red gum and black box woodlands of the Lower Murray Valley*, fact sheet [online] lwa.gov.au/products/pn22381

Kumar A, Manning T & Pearson S 2009, *Targeting endocrine disruptors in Australia's waterways*, discussion paper [online] lwa.gov.au/products/pn22054

Lane P, Sheridan G, Noske P, Costenaro J, Sherwin C, Szegedy G & McKenna P 2009, *Dynamics of sediment and nutrient fluxes from burnt forest catchments*, final report [online] lwa.gov.au/products/pn22320

Leigh C 2009, *Testing ecological models in Australia's northern tropical rivers*, PhD thesis, Griffith University

Lester M 2009, *Agri-environmental stewardship program architecture: towards convergence in the USA and Europe?* Discussion paper [online] lwa.gov.au/products/pn22135

Macinnis-Ng C & Eamus D 2009, *Carbon uptake and water use of vegetation under climate change*, fact sheet [online] lwa.gov.au/products/pn30132

Macinnis-Ng C & Eamus D 2009, *Woody thickening: the increasing density of shrubs and trees across a landscape* (in prep)

Mainwaring D 2009, *Healthy catchments through detection and remediation of contaminants with novel technologies*, final report [online] (in prep—lwa.gov.au/products/pn30156)

McKeon G 2009, *Climate change and natural resource management in Australia's grazing lands*, final report and executive summary [online] lwa.gov.au/projects/3236

Pusey B, Kennard M, Hutchinson M & Sheldon F 2009, *Ecohydrological regionalisation of Australia: a tool for management and science*, final report [online] lwa.gov.au/products/pn22591

Schilizzi S & Black J 2009, *Breaking through the equity barrier in environmental policy*, final report [online] lwa.gov.au/products/pn21249

Schilizzi S 2009, *Looking into equity in environmental decisions for policy makers*, fact sheet [online] lwa.gov.au/products/pn22144

Stafford-Smith M (in prep) *Blueprint for a Red Land*, CSIRO Publishing, Canberra

Stirzaker R (in prep) *The Scientist's Garden*, CSIRO Publishing, Canberra

Treble P 2009, *Characterising south-west Australia's rainfall using speleothems and climate models* (in prep—lwa.gov.au/products/pn30154)

Weaver T 2009, *Sustainability of fresh water lenses under major rivers*, final report [online] lwa.gov.au/products/pn30169

White B & Lester M 2009, *How does the international experience of agri-environment schemes inform Caring for our Country?* fact-sheet [online] lwa.gov.au/products/pn22142

White B, Raguragavan J & Sadler R 2009, *Agricultural land retirement as environmental policy*, fact sheet [online] lwa.gov.au/products/pn22140

Whitley R & Eamus D 2009, *How much water does a woodland or plantation use? A review of some methods*, fact sheet [online] lwa.gov.au/products/pn30133

Social and Institutional Research Program

Adaptive agriculture NRM stocktake 2009, final report (in prep)

Agreements that recognise customary law in water management 2009, final report and fact sheet (in prep)

Buxton M & Low Choy D 2008, *Change and continuity in peri-urban Australia*, fact sheet [online], monographs, memory-stick, lwa.gov.au/products/pn22026

Hill R & Crase J 2008, *Developing a cultural and conservation economy for Northern Australia*, fact sheet [online] lwa.gov.au/products/pf081445

Indigenous NRM stocktake 2009, final report (in prep)

Land & Water Australia 2008, *New markets: buying and selling environmental goods and services* (cross-program synthesis of six MBI projects), fact sheet [online], memory stick, lwa.gov.au/products/pn22003

Land & Water Australia 2008, *Sustainable northern landscapes and the nexus with northern Australia: healthy country, healthy people* [online] final report/fact sheet (in prep—lwa.gov.au/products/pn30115)

Rea N & Anmatyerr Water Project Team 2008, *Provision for cultural values in water management: the Anmatyerr story*, final report [online] lwa.gov.au/products/pr081464 (dvd also produced pr051465)

Regional NRM stocktake 2009, final report (in prep)

Roughley A & Williams S 2008, *The engagement of indigenous Australians in natural resource management*, fact sheet [online] lwa.gov.au/products/pn21610

Salvin S 2008, *Successful investments in NRM practice change stage 2*, fact sheet [online] lwa.gov.au/products/pn21203

Stoneham G 2008, *Creating markets for environmental goods and services: a mechanism design approach*, final report [online] lwa.gov.au/products/pn21935

White B 2008, *Contracting and monitoring landholder conservation agreements*, fact sheet [online] lwa.gov.au/products/pn22024

Climate Change Research Strategy for Primary Industries Program

Land & Water Australia 2009, *Australia's primary industries working together on climate change*, fact sheet

Land & Water Australia 2008, *A National Climate Change Research Strategy for Primary Industries: Phase 1 Report*, final report [online] lwa.gov.au/products/pn21393

Land & Water Australia 2008, *A National Climate Change Research Strategy for Primary Industries: Summary Fact sheet*, fact sheet [online] lwa.gov.au/products/pn21395

Managing Climate Variability Program

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Managing Climate Variability 2008, *Managing Climate Variability R&D Strategy 2008–2014*, report [online] managingclimate.gov.au/Publications_and_Tools

Managing Climate Variability 2009, *Climag*, edition 16, January [online] managingclimate.gov.au/Publications_and_Tools

Managing Climate Variability 2009, *Climag*, edition 17, June [online] managingclimate.gov.au/Publications_and_Tools

Also available from the MCV website are 38 communicating climate change fact sheets produced by MCV during 2008–09.

National Program for Sustainable Irrigation Program

Biswas T, Bourne J, Schrale G & McCarthy M 2009, *Salinity management practice guidelines*, Sustainable Irrigation Management Update

Biswas T, Pitt T, Bourne J et al 2009, *Rootzone water, salinity and nutrient management,* technical report

Conner S 2009, *Separating almond evapotranspiration into soil water evaporation and crop transpiration*, research bulletin

Hall A (ed) 2008, *Irrigation and the root zone*, Irrigation Update 9

Hughes N & Goesch T 2009, *Capacity sharing in the St George and McIntyre Brook irrigation schemes in Southern Queensland,* final report [online] abareconomics.com/publications_html/news/news/news.html

Hughes N & Goesch T 2009, *Management of irrigation water storages*, Sustainable Irrigation Management Update

Hughes N & Goesch T 2009, *Management of Irrigation Water Storages,* final report [online] abareconomics.com/publications_html/news/news/news.html

Land & Water Australia 2009, *Optimising delivery and benefits of aerated irrigation water*, DVD and web clips, filmed and produced by Land & Water Australia

Land & Water Australia 2009, *Soil management for Australian irrigated agriculture,* DVD and web clips, filmed and produced by Land & Water Australia

Leonardi S & Hall A (ed) 2009, *Modernising irrigation water delivery systems*, Irrigation Update 10

Lomax Media 2009, *Modernisation workshop*, DVD and web clips from 2009 field trip and presentations, filmed and produced by Lomax Media

National Program for Sustainable Irrigation 2008, *NPSI Strategic Plan 2008–2010*, report [online] lwa.gov.au/products/pk081447

Peter Day Resource Strategies 2009, *Irrigation in Australia—facts and figures*, information publication

Peter Day Resource Strategies 2009, *Using recycled water for irrigation—an overview of the issues, opportunities and challenges*, information publication

Peter Day Resource Strategies 2009, *Vital role for Australian irrigation*, information publication

Smith R 2009, *Defining precision irrigation: a new approach to irrigation management*, research bulletin

Stottelaar R 2009, *Investigating lake/groundwater interactions at Lake Tutchewop*, research bulletin

Treeby M 2009, *Managing fertigation technologies in citrus orchards*, research bulletin

Defeating the Weed Menace Program

Auld B 2009, *A commentary on funded biological control projects*, ISBN 9781921544576

Auricht C & Yapp G 2009, *A national information system for weeds: What do end-users need?*

Colloff M, Ede F, Morin L, Lindsay E & Stokes K 2009, *Control of environmental weeds: an integrated framework for natural resource management*, ISBN 9781921544613

Friedel M, Marshall N, van Klinken RD & Grice T 2009, *Benefits and costs of buffel grass: understanding perceptions can contribute to policy development*, ISBN 9781921544651

Herpich M & Landsay A 2008, *The Environmental Weed Management Action Tool (EWeed MAT)—a new tool for regional environmental weed planning*, LWA PN21608

Land & Water Australia 2009, *Thinking Bush 8: Thinking Weeds*, March, special edition featuring research outcomes from the DWM program.

Miles RL, Kinnear S, Friedel M, Grice AC, van Klinken RD, Setterfield S & Herpich M 2009, *Policy, institutional and managerial considerations in managing weeds with a commercial value*, ISBN 9781921544699

Paynter Q 2009, *Improving targeting of weed biological control projects in Australia*, ISBN 9781921544774

Quinn LD, Schooler SS & van Klinken RD 2009, *Prevention and management of aquatic plant invasions in Australian rivers*, ISBN 9781921544590

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Scott J, Batchelor K, Ota N & Yeoh P 2009, *Sleeper and alert weeds: Where will they awaken as climate changes?* ISBN 9781921544514

Sindel B, Jhorar O, Reeve I, Thompson L-J & Coleman M 2009, *Best practice for on-ground property weed detection*

Stokes K & Colloff M 2009, *Weed management on floodplains: A guide for natural resource managers*, ISBN 9781921544637

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Brookes J & Aldridge K 2008, discussion paper provided to management agencies on pumping the South Lagoon of the Coorong

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Robson BJ, Chester ET, Austin C, Wickson S & Miller A 2009, *EWA required to sustain macroinvertebrate species in ephemeral streams*, Environmental Water Forum, Canberra, May 2009.

Wickson S, Robson BJ & Chester ET 2008, *Adaptations to an arid environment — aestivation and diapause in drought resistant caddisflies*, 47th National congress of the Australian Society for Limnology, Mandurah WA.

Young M & McColl J 2009, *A future—proofed Basin: A new water management regime for the Murray-Darling Basin*, final report (online) lwa.gov.au/products/pn30218

Young M 2008, *Grounding connectivity: do rivers have aquifer rights?* Droplet 13, discussion piece [online] www.myoung.net.au/water

Young M 2008, *Yucky business: paying for what we put down the drain*, Droplet 14, discussion piece [online] www.myoung.net.au/water

Young M 2009, *More from less: When should river systems be made smaller and managed differently?* Droplet 16, discussion piece [online] www.myoung.net.au/water

Young M 2009, *Shepherding water: unregulated water allocation and management*, Droplet 15, discussion piece [online] www.myoung.net.au/water

Young M 2009, *Water security: Should urban water use, like rural water use, be capped?* Droplet 17, discussion piece [online] www.myoung.net.au/water

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