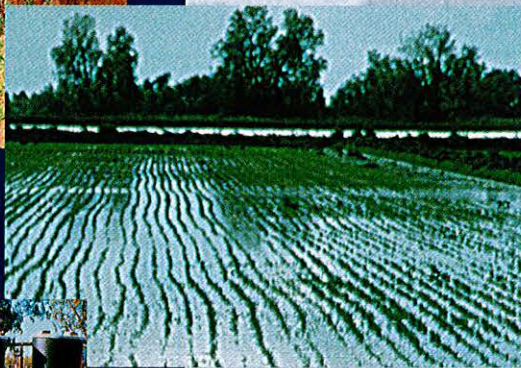
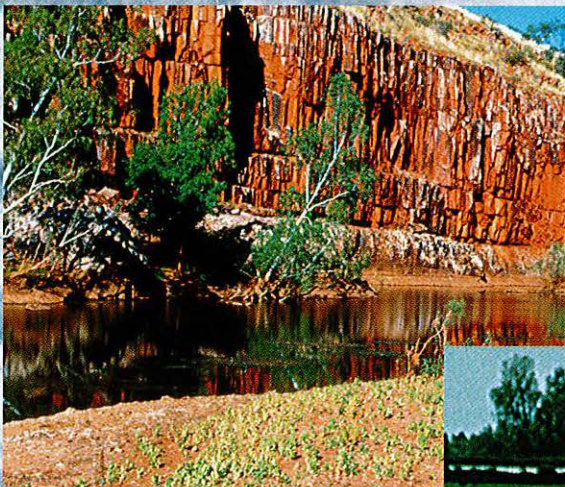




**Land & Water
Resources**

Research &
Development
Corporation

Stakeholders Report 1999

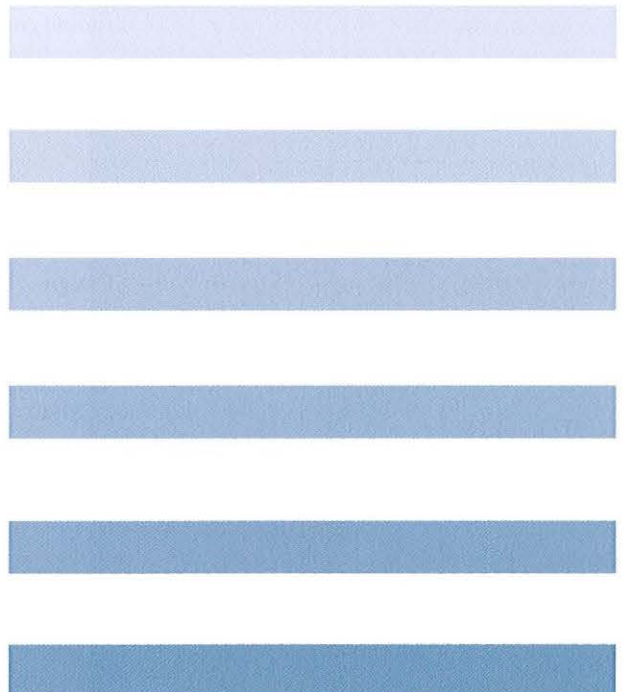




**Land & Water
Resources**

Research &
Development
Corporation

Stakeholders Report 1999



Published by:

**Land and Water Resources
Research and Development Corporation**

GPO Box 2182
Canberra ACT 2601

Telephone: (02) 6257 3379
Facsimile: (02) 6257 3420
Email: public@lwrrdc.gov.au
WebSite: www.lwrrdc.gov.au

LWRRDC
Level 2
UNISYS Building
91 Northbourne Avenue
Turner ACT 2612

© LWRRDC

The information contained in this publication has been published by LWRRDC to assist public knowledge and discussion and to help improve the sustainable management of land, water and vegetation. Where technical information has been prepared or contributed by authors external to the Corporation, readers should contact the author(s), and conduct their own enquiries before making use of that information.

Publication data: 'Stakeholders Report 1999'

ISSN: 1323-4242

Text and design: Themeda—Research Writing Design

Photographs: Peter Davies, Jane Suggitt, Stuart Halse, Baden Williams, Bill Williams, Nicholas Woods, Ross Kapitzke, Hector Malano, Nick Schofield, David Eastburn, Murray–Darling Basin Commission, NSW Environment Protection Agency, CALM WA, CSIRO

Printer: Goanna Print

Printed on 50% recycled paper.

February 2000

Abbreviations	iv
Introduction	1
Corporation overview	
Mission	2
Objectives	2
Research and development	3
Highlights	4
The Australian scene	6
Case studies	8
LWRRDC priority programs	10
Programs managed by others	14
Other LWRRDC programs	16
Other R&D initiatives	19
LWRRDC performance 1998–1999	
Against targets	20
Financial performance	22
Future directions	23
People	
Directors	25
Officers	27
R&D Program Coordinators	27
National Land and Water Resources Audit	
Overview	28
Officers	29
Financial information	30
Publications	31
Request and feedback form	33
National Land and Water Resources Audit	
Information products order form	35

C O N T E N T S

ABBREVIATIONS

AFFA	Agriculture, Fisheries and Forestry—Australia
Audit	National Land and Water Resources Audit
AUSRIVAS	Australian River Assessment Scheme
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVAP	Climate Variability in Agriculture R&D Program
DoD	Department of Defence
EA	Environment Australia
JVAP	Joint Venture Agroforestry Program
LWRRDC	Land and Water Resources Research and Development Corporation
MDBC	Murray–Darling Basin Commission
MLA	Meat & Livestock Australia
NAP	North Australia Program of Research and Development
NDSP	National Dryland Salinity Program
NEMP	National Eutrophication Management Program
NFF	National Farmers Federation
NPIRD	National Program for Irrigation R&D
NRC	National Rivers Consortium
NRHP	National River Health Program
R&D	Research and development
RAAL	Redesigning Agriculture for Australian Landscapes R&D Program
RIRDC	Rural Industries Research and Development Corporation
SCARM	Standing Committee on Agriculture and Resource Management
SGS	Sustainable Grazing Systems
SHEF	Self help evaluation framework
SIRP	Social and Institutional Research Program

The Land and Water Resources Research and Development Corporation (LWRRDC) has a unique research and development (R&D) portfolio that extends across the full scope of natural resource management in Australia. Accordingly, as issues in this field change, LWRRDC must assess and modify its priorities and operations. In order to ensure that LWRRDC achievements maintain a high level of integrity, the organisation has again taken the opportunity to examine its strategic focus.

Over the past few years, it has become increasingly obvious that natural resource management is a huge field of endeavour. It has also become obvious that results from R&D activities need to be taken up and applied by natural resource managers at all levels. Using these observations LWRRDC, is modifying its approach to R&D and its role in promoting uptake of R&D outputs.

LWRRDC has recognised that, by itself, it does not have the resources to tackle the entire range of natural resource management issues that exist and has decided to:

- reduce the range of topics it directly pursues; and
- emphasise its role in brokering collaborative partnerships with other organisations.

Although LWRRDC still maintains an interest in many program areas, some of these are now due to be finalised and others have been taken over by other organisations. LWRRDC is pursuing a continuing strong interest in:

- climate variability in agriculture;
- sustaining native vegetation in rural landscapes;
- dryland salinity;
- sustainable irrigation industries;
- river restoration and management;
- redesigning agriculture for Australian landscapes; and
- social, institutional and policy issues.

LWRRDC is also aware that much good quality R&D remains known only in the research environment without being accepted or used by resource managers at Commonwealth, State/Territory and local government levels, or by regulatory bodies, industry associations or landholders. Quality R&D needs to be successfully communicated right across this range of stakeholders so that new knowledge and guiding principles arising from this work can be applied to the national benefit.

LWRRDC has increased its investment with partners both in R&D; and in packaging and communicating program outputs, and demonstrating and evaluating the costs and benefits of new management practices.

The National Land and Water Resources Audit (Audit) is continuing to make good progress. It has identified and defined seven major themes in land degradation. The majority of associated project work has been contracted and is underway. A number of implementation projects testing methods and aiming to assist the States and Territories with particular resource management issues have also commenced. The Audit is now focusing attention on ensuring that contracted projects meet their objectives in full, and on analysing and collating a wide range of natural resource data to develop publicly-available products that will assist natural resource decision making by governments, industry groups and community organisations.



Alex Campbell
LWRRDC Chairman

INTRODUCTION

CORPORATION

OVERVIEW

LWRRDC Mission

To provide national leadership in utilising research and development (R&D) to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources. The Corporation will establish directed, integrated and focused R&D programs where there is clear justification for additional public funding to expand or enhance the contribution of R&D to sustainable management of natural resources.

LWRRDC Objectives

R&D Investment

To develop, fund and manage R&D activities where the Corporation's involvement in leadership, design, funding and management will significantly enhance the sustainable use, productivity and conservation of Australia's land, water and vegetation resources.

Communications

To initiate, fund and manage activities in association with its R&D portfolio that raise awareness of, exchange information about, and promote adoption of, improved sustainable use, management and conservation of land, water and vegetation resources.

Management

To evaluate and improve the efficiency, effectiveness, focus and balance of its portfolio of land, water and vegetation R&D.

Land degradation cannot be placed into separate, tidy pigeonholes. Each environmental problem does not just remain in its own corner of the landscape: for instance acidity and salinity in soils, erosion on the land. Instead they cross biophysical, social and economic boundaries: land degradation in one place affects non-degraded land and water elsewhere; it goes from one production type to another; moves through catchments; and affects small and large landholders and communities.

Accordingly and appropriately the focus of LWRRDC has also shifted to a landscape perspective. Rather than trying to separate out the issues and reducing them to their individual components, LWRRDC is providing an umbrella organisation that looks across the whole picture. R&D is still conducted within the bounds of commissioned programs as this enables researchers to determine the best way to tackle a particular problem. It is also now well recognised that findings from any natural resource management area will have implications for other areas.

This is not a slight task but it is one for which LWRRDC is eminently suited with its charter encompassing land, water and vegetation R&D.

LWRRDC has also expanded its R&D from an emphasis solely on biophysical research. R&D needs to be adopted and implemented and hence LWRRDC is improving its communication strategy and conducting research into social and institutional requirements associated with natural resource management and its sustainability.

LWRRDC has a strong management responsibility in several programs which cover the main areas of land degradation in Australia, including:

- Climate variability in agriculture
- Remnant vegetation
- Dryland salinity
- Irrigation
- Rivers and riparian lands (one program with two main components: National Rivers Consortium and Riparian Lands)
- Redesigning agriculture for Australian landscapes
- Social and institutional research (incorporating Integration and Adoption)

LWRRDC supports some programs which are managed by others including:

- Wetlands (EA)
- North Australia Program (MLA)
- Joint Venture Agroforestry (RIRDC)
- Sustainable Grazing Systems (MLA)

LWRRDC is continuing participation and support in other 'satellite' or special case programs (some of which will be finalised over the next year or so) including:

- River health
- Eutrophication management
- Sustainable use of groundwater
- Environmental management of military lands
- Rangelands

LWRRDC is continuing its interest in other resource management issues through identifying carefully-targeted and catalytic projects within the biennial General Call.

RESEARCH AND DEVELOPMENT

R&D highlights

Climate variability

Seasonal climate forecasts incorporating sea temperature of the Pacific and Indian Oceans are now in operation and demand for climatic information is increasing. The Climate Variability in Agriculture Program (CVAP) has also been a catalyst for an expanded effort at the State and Territory level with the creation of specialist climate groups.

In conjunction with the Rural Industries R&D Corporation, CVAP has produced a new version of Australian RAINMAN and a range of grazing management tools in the DroughtPlan CD-ROM.

Remnant vegetation

Priority areas for future remnant vegetation management and the consequent priorities for R&D, have been identified in a vegetation foresighting exercise.

Dryland salinity

Phase II of the National Dryland Salinity Program (NDSP) is emphasising the need for R&D to be seated firmly within an institutional and socioeconomic framework, and for enhanced communication of outcomes to people on the ground.

Research results from the first phase of the NDSP were used as the basis of a report by the Prime Minister's Science, Engineering and Innovation Council presented to the Prime Minister.

Irrigation

Mutually-agreed terms and definitions for water use efficiency have been determined along with improved methods of measuring water flows. Benchmarking the performance of irrigation supply activities nationwide has completed its first year and a detailed manual on participative processes to achieve adoption of better technologies and practices has been prepared.

Rivers and riparian lands

A new national framework for the restoration and protection of rivers has been developed to prototype stage. The main activity has been the scoping of a National Rivers Consortium (NRC) and the establishment of a 6-month initial phase.

The first detailed set of Australian riparian management guidelines and an Australian manual on stream rehabilitation have been published. The latter is available as an interactive CD-ROM.

Redesigning Australian agriculture

Field studies in Western Australia have identified key functions that need to be incorporated into plant species and agricultural systems to optimise water and nutrient uptake. The ability of native plants to move water between shallow and deep soils according to season and soil moisture availability has also been shown.

Models are being used to test the long-term sustainability of current and novel production systems over long sets of climatic data.

Social and institutional research

The Social and Institutional Research Program has released a self help evaluation framework (SHEF) to assist catchment management committees to assess processes and performance. The program has also developed a Catchment Information System that enables catchment groups to become masters of any information overload.

Eutrophication management

National guidelines have been released for algal sampling and analysis. Scientists have released a statement on which nutrients limit algal growth and when they do so.

Groundwater

A national assessment and case studies on groundwater pollution by nitrates has been published. A sophisticated GIS-based tool for assessing the risk of groundwater pesticide contamination has been released.

Rangelands

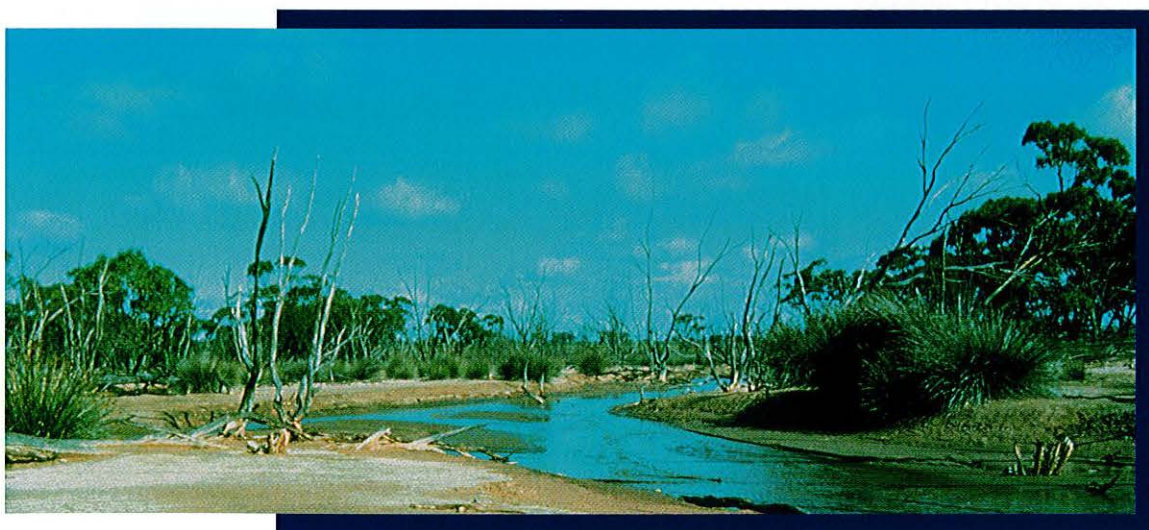
Work on rangelands has shown that in many situations closure or repositioning of water points, can substantially improve the conservation of biodiversity, while having a minimal impact on production and economic returns from grazing.

North Australia program

The North Australia Program is suggesting work, among other projects, on the costs and benefits of incorporating native vegetation management into grazing enterprises.

Sustainable grazing systems

The Sustainable Grazing Systems (SGS) Tips & Tools is now distributed across the regional producer network. The SGS newsletter (PROGRAZIER®) reaches 10,000 producers across the high rainfall zone. More than 100 providers are now accredited to deliver PROGRAZE®.



The Australian scene

Australia is a big country. Although parts of Tasmania and Queensland are very wet, most of the continent is extremely dry. Difficulties for agricultural industries caused by the arid nature of the land are exacerbated by Australia's extremely *variable climate* where rainfall can vary by more than 100% from one year to the next.

Australia's native plants and animals have evolved to cope with its variable climate, but since modern European agriculture was introduced 200 years ago, much of the native *vegetation* has been cleared to make way for introduced crops, pasture and livestock. This clearing has now occurred to such an extent that only *remnants* of the original vegetation remain.

It is now recognised that native vegetation has intrinsic value since it:

- provides biodiversity in a world that is fast losing species;
- can cope with Australian climate and soils far better than introduced species are able; and
- can maintain the water balance in the soil far better than the introduced plants.

Clearing the land has allowed *dryland salinity* to develop in patches across much of southern Australia's prime pasture and cropping lands. Dryland salinity occurs when the amount of water entering and leaving the soil is not in balance. Water which is not totally used can cause the soil to become waterlogged; this water can also dissolve salts in the soil and transport them to the surface and into surface and groundwater supplies.

Clearing has also affected the *health* of Australia's *rivers* and *wetlands* with *eutrophication* as a major area of concern.

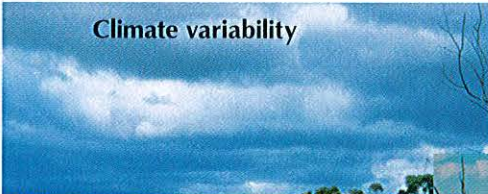
Some of Australia's agriculture depends on *irrigation* from both surface water bodies and groundwaters. The unused water from irrigated and fertilised lands flows back into the rivers and *groundwater* aquifers carrying with it any salts or nutrients that are also unused.

The sum of these land management issues requires a two-pronged approach: the rivers themselves need *restoration and management* but *Australian agriculture* also needs to be *redesigned* to ensure that it is better able to cope with the prevailing climate and soils. Some special areas for consideration are: *military lands*, *rangelands* and *north Australia*. *Agroforestry* and more *sustainable grazing systems* are two areas that could assist in this process.

Change cannot happen in a vacuum. Any attempt to alter natural resource management practices requires an understanding of the *social and institutional* issues that may impinge on this process.

LWRRDC RESEARCH PROGRAMS

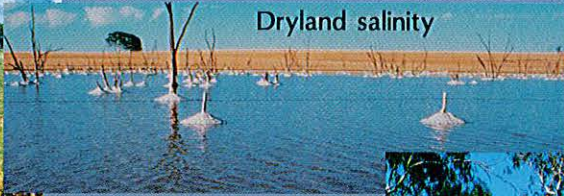
Climate variability



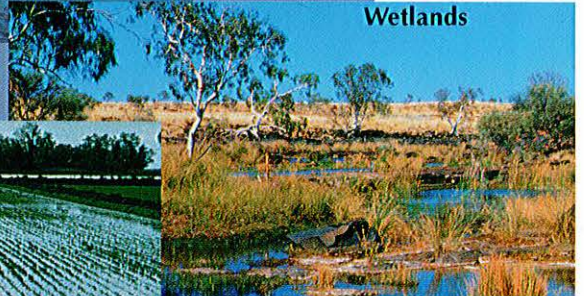
Remnant vegetation



Dryland salinity



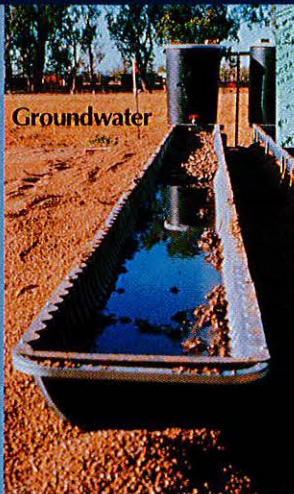
Wetlands



Redesigning agriculture for Australian landscapes



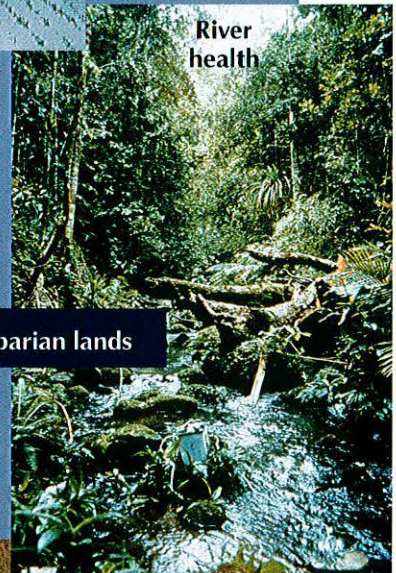
Groundwater



Irrigation

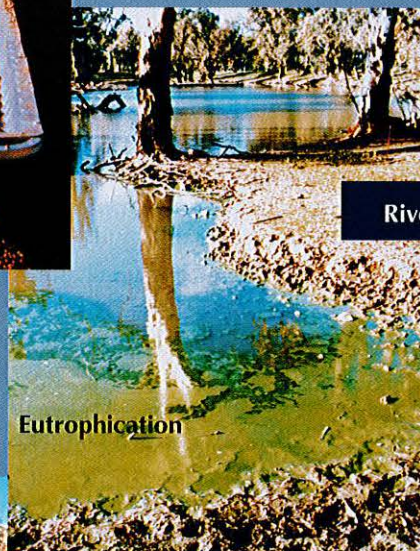


River health



Rivers and riparian lands

Eutrophication



Military lands

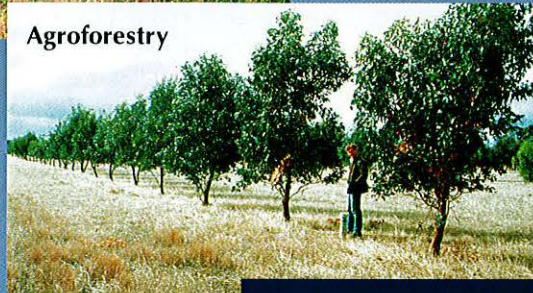


Sustainable grazing systems



Rangelands

Agroforestry



North Australia



Social and institutional research

RESEARCH AND DEVELOPMENT: CASE STUDIES

Best management of pesticides

Chemical compounds are used throughout the agricultural industry for control of various insect and other pests. Although considered to be beneficial to output in some industries, they can also have significant adverse costs on the environment and on agricultural produce:

- pesticides can be expensive to buy and to apply;
- drift can adversely affect neighbouring agricultural enterprises and thereby incur penalties; and
- reports of pesticide contamination of environment and products can adversely affect Australia's reputation of being clean and green.

LWRRDC project UQL13—The Aerial Application of Pesticides: Development of Guidelines for Best Management Practice in the Riverine Environment—is aiming to reduce pesticide spray drift.

Spray drift can be reduced by gaining an understanding of the conditions that enhance its occurrence. Possible factors include:

- amount of chemical sprayed;
- droplet size;
- time of application;
- size of buffer areas; and
- maturity of crop.

UQL13 was developed with particular attention to the riverine environment and to conditions prevailing in the cotton industry where applications of the chemical, endosulfan, are already known to be adversely affecting nearby cattle enterprises.

The project will benefit people in associated agricultural industries, and Australia's clean and green reputation, as well as the general community. Modelling commissioned by LWRRDC has shown that for a total outlay on this project of \$200,000, benefits to the nation will be in the order of \$1m.

Results will be disseminated by presentation of findings at conferences, industry workshops, scientific and popular press.

Opportunities for the use of incentive payments for remnant vegetation

Much of Australia's native vegetation has already been cleared and replaced by cities, roads, mines and agricultural enterprises. Active clearing is still occurring in some States. But Australia's native vegetation suits the landscape in which it has evolved and it is now well-known that these plants can manage water better than introduced species.

Australia also has a policy of preserving endemic species to maintain biodiversity and this policy can only be achieved by preserving the few remaining patches of native vegetation.

Many of the pockets of native vegetation that do still remain are to be found on private lands. While governments are able to legislate against clearing in some circumstances, such actions can tend to exacerbate landholder feelings so that cooperation with these laws is not forthcoming and incentives are required to enhance the retention of native vegetation.

LWRRDC project CWE13—Opportunities for the Use of Incentive Payments to Conserve Remnant Vegetation—is aiming to translate general policy recommendations into concrete proposals for change. Proposals include:

- making payments and agreements for conservation covenants more cost-effective;
- encouraging local government to become more active in the protection of remnant vegetation;
- removing negative signals that many tax and rating systems transmit to landholders;
- encouraging non-government organisations to raise money for vegetation conservation; and
- making the cost of conserving remnant vegetation tax deductible.

The project will achieve economic benefits by gaining a more representative network of conservation areas at a lower total cost.

Results will be distributed through targeted press releases and presentations.

RESEARCH AND DEVELOPMENT: CASE STUDIES

Earthworms for pasture production

Modern agricultural practices tend to compact and destroy the structure of soil; they promote soil loss through erosion, and degrade soil fertility by removing nutrients from the environment.

Earthworms on the other hand have the ability to aerate soil and enhance its fertility. They also assist in root and water penetration.

Earthworms are now being investigated for their value in counteracting effects of heavy machinery and improving pasture condition. LWRRDC project CEN4—Introducing earthworms to reduce soil acidity and increase pasture production—is a General Call project that aims to promote use of earthworms for sustainable agriculture.

Following the finding that some earthworms are able to transport artificially applied lime into the soil before it is lost to runoff, this project is developing cost-effective methods of production and inoculation to improve incorporation of lime into pasture and to reduce the traffic of heavy equipment on paddocks. Outputs from the project include:

- guidelines for the earthworm farming industry;
- guidelines for earthworm suppliers and farmers; and
- established field populations to demonstrate the effectiveness of the European earthworm *Aporrectodea longa*.

Benefits from this project will be the more sustainable use of the landscape such as maintenance of soil structure and fertility, as well as reduced capital and labour costs in achieving this goal.

Results from this project are being distributed through State departments, Landcare groups, CSIRO, media and farmer groups, field days, and commercial partnerships.

Riparian demonstration sites

Riparian zones of rivers and streams are under threat from clearing and livestock, mining of sand and gravel, removal of snags, and invasion by woody weeds.

At the same time however, community action to address these and other problems in riparian zones is taking place.

A LWRRDC project on the Mary River in Queensland has set up sites to demonstrate cost-effective rehabilitation of riparian zones.

The demonstration has included:

- tree planting of river banks to provide shade and stability;
- channel realignment and riffle construction to reduce pressure on vertical banks; and
- construction of a rock ramp fishway to ensure clear passage of fish up the river.

Activities at most sites have withstood recent floods on the Mary River (including the greatest flood this century).

Local landholders are now conducting 30 more river restoration projects in the Upper Mary River and the site is being visited by people from throughout the state and internationally. The project has promoted community strength as well as solid physical benefits. Landholders are convinced that these riparian demonstration sites are as good as 'gold in the bank' for the long-term sustainability of their farms.



LWRRDC PRIORITY PROGRAMS



Climate variability in agriculture

Droughts and floods adversely affect Australian farm outputs, but a variable climate affects more than just the agricultural sector. Losses to the Australian national income from climate variability were roughly \$3 billion during the early 1990s.

A major focus of the Climate Variability in Agriculture R&D Program (CVAP) has been to gain an improved understanding of the Australian climate, and a capacity to predict and monitor climate variability and its impact. The program goal is to work with Australian agriculture to develop and implement profitable and sustainable strategies.

As a result, improvements have occurred in climate forecasting in southern Australia and a new forecast system using sea surface temperatures in the Pacific and Indian Oceans has been launched.

CVAP also focuses on improving natural resource management skills so that land and water managers are aware of available technologies that can assist them in preparing for climate variability. CVAP is:

- facilitating development of climate information so that land managers can respond confidently to a changing climate; and
- promoting changes to farming systems to improve adaptation to climate variability risks and opportunities.

Climate information produced by the programs is being accessed through fax hot lines and the Internet.

CVAP has also been a catalyst for change with specialist climate groups being created in Queensland, New South Wales and Western Australia.

CVAP has developed links with other LWRRDC programs (eg. Redesigning Agriculture for Australian Landscapes, and Social and Institutional Research).

CVAP has implemented its communication plan with the launch of its newsletter *CLIMAG*, fact sheets for all projects and a website at www.cvap.gov.au.

Collaborating organisations

Lead agency: LWRRDC

Funding partners: AFFA; R&D Corporations—Rural, Grains, Sugar and Dairy; NFF

Further information: Barry White, (07) 3371 5878, bjwhite@b022.aone.net.au

Remnant vegetation

Estimates indicate that between 43% and 88% of Australia's native vegetation had been cleared from Australia's temperate and sub-tropical regions and that clearing is still occurring.

But retention of native vegetation does have advantages; it can:

- reduce recharge and the spread of salinity;
- minimise erosion and soil loss;
- provide habitat for wildlife and assist in natural pest control;
- provide shade and shelter for crops, pasture and stock;
- provide aesthetic values;
- help to maintain genetic diversity and self regeneration; and
- act as a carbon sink that can contribute to meeting greenhouse targets.

Native vegetation is an indicator of sustainable agriculture in terms of extent and health, and demand by markets for environmentally sound agricultural practices will in part focus attention on sustaining remaining native vegetation.

The National Remnant Vegetation R&D Program is:

- developing practical methods to incorporate native vegetation management into regional and property plans;
- identifying remnants that are most at risk and ranking those with greatest ecological value;
- identifying management intervention to conserve remnants and to maintain or improve their ecological status; and
- researching socioeconomic factors and methods to involve managers in research and adoption programs so that policies, programs and incentives are more effective.

Program projects have:

- developed tax incentives to encourage managers to retain native vegetation, guides for native vegetation management and an evaluation toolkit for bushland restoration;
- identified specific conservation sites in native vegetation communities; and
- collected data on the relative importance of patches of remnant vegetation.

The program has links with other programs in agroforestry, riparian management, salinity, social and institutional change, and rangelands.

Collaborating organisations

Lead agencies: LWRRDC, EA

Further information: Jann Williams, (02) 6257 3379
jann.williams@lwrrdc.gov.au

LWRRDC PRIORITY PROGRAMS



Dryland salinity

Dryland salinity is now recognised to be a land degradation problem that is not only widespread (almost 2.5 million hectares currently affected across the landscape) but one that is steadily growing. As much as 15 million hectares of land could be salinised over the next 30 to 50 years if current land use practices do not change. Dryland salinity costs Australia at least \$270m each year in lost agricultural production, damage to infrastructure and reduced environmental values.

In the past the National Dryland Salinity Program (NDSP) has focused on determining how salinisation occurs and finding remedial solutions. But with the recognition of the widespread nature of the problem and its near irreversibility, part of the program's focus is now shifting to how to better live with dryland salinity, rather than trying to repair the unfixable. At the same time research into prevention and remediation is continuing.

NDSP is also concentrating on communication of its R&D results by establishing stronger links between the research community and the community groups who must live and deal with the problem.

NDSP has developed:

- guidelines establishing the costs of dryland salinity;
- improved tools and techniques to estimate the deep drainage, water imbalance; and
- methods to use remotely sensed data and thereby monitor the risk of dryland salinity.

The program is collaborating with a range of funding, research and management partners to gain better outcomes and is concentrating on:

- solutions;
- institutional arrangements;
- management of saline landscapes; and
- landscape ecosystems and processes.

Collaborating organisations

Lead agency: LWRRDC

Funding partners: R&D corporations—grains and rural industries, MDBC, NLWRA, National Landcare Program (AFFA)

Research partner: CSIRO

Management partners: State Government departments

Further information: Nicholas Newland, (08) 8204 9153, nnewland@dehaa.sa.gov.au

Irrigation

Irrigation of agricultural land has occurred in Australia since the 1800s. But although irrigated land represents only 1% of the total land area used for agriculture, it is estimated that production from this land is worth \$6 billion with flow-on effects of as much as \$24 billion. Roughly 70% of developed water resources flow into irrigated lands and there is significant pressure for this to increase.

The National Program for Irrigation R&D (NPIRD) is:

- improving water use efficiency;
- developing an understanding of environmental impacts of and effects on irrigation;
- evaluating the effects of socioeconomic and policy issues;
- extending irrigation knowledge and its use; and
- benchmarking and monitoring irrigation performance.

NPIRD has developed a benchmarking protocol on water use efficiency that has been adopted by the Council for Australian Governments (COAG). It has assisted in industry and on-farm benchmarking.

NPIRD is developing and promoting:

- a national framework demonstrating benefits of water use efficiency principles;
- improved awareness, understanding and capacity to respond to the interaction between irrigation and catchment processes;
- irrigation knowledge, practice and technology;
- enhanced performance through benchmarking;
- evaluation of water reform effects on irrigation and their capacity for change; and
- increased internalisation of R&D investment where private benefits accrue, and more strategic and focused R&D where public benefits are involved.

Collaborating organisations

Lead agency: LWRRDC

Funding partners: State Government departments, water authorities, industry organisations, private irrigators, CSIRO

Further information: Brett Tucker, (02) 6964 1873, mcs@webfront.net.au

LWRRDC PRIORITY PROGRAMS



Rivers and riparian lands

Australia is the driest continent on Earth and rivers are an important part of the landscape. But Australia's rivers are in poor physical and ecological condition with impacts coming from:

- land clearing and intensive land use;
- flow regulation and extraction;
- riparian zone degradation;
- declining water quality;
- changes to river physical form and geomorphic conditions; and
- exotic biota.

Temperate riparian zones are regarded as the ecological arteries of the landscape. Riparian vegetation supplies energy and nutrients to rivers, and regulates aquatic plants and animals. It helps to stabilise streambanks and can trap and hold sediment and nutrients from upslope intensive agriculture. Removal, fragmentation or alteration of vegetation in riparian lands, together with changes to the flow regime of rivers, has led to widespread problems including:

- increased bank erosion and slumping;
- loss of agricultural land during floods;
- changes in channel morphology;
- invasion of weed species
- increased movement of sediment, nutrients and other contaminants into river systems;
- rising watertables; and
- movement of salt and nutrients into streams through increased groundwater flow.

R&D has shown that riparian shade is critical to maintaining healthy in-stream life even in the presence of enhanced nutrient levels. It has also shown that temperate and dryland riparian systems act differently to each other with algae rather than the riparian and floodplain vegetation as the drivers in the dryland systems.

Water quality treatment, remedial work, protection of infrastructure (roads, bridges, and buildings), flood mitigation and control are expensive.

The River Restoration and Management Program will:

- develop appropriate frameworks and processes;
- select, develop and promote best practice management techniques;
- increase skills and capacity;
- identify knowledge gaps and R&D priorities;
- support existing programs; and
- communicate ideas and findings.

At this early stage in its life the program is developing strategic and action plans and determining knowledge gaps which require R&D and scoping the new National Rivers Consortium.

A river restoration and management website has been established and will be used to provide ready access to research outputs and publications arising from this program.

Collaborating organisations (River restoration)

Lead agency:	LWRRDC
Funding partner:	AFFA, CRCs for Catchment Hydrology, Freshwater Ecology, CSIRO Land and Water, MDBC
Associated agencies:	State Government agencies
Further information:	Nick Schofield, (02) 6257 3379, nick.schofield@lwrrdc.gov.au

Collaborating organisations (Riparian lands)

Lead agencies:	LWRRDC, CRC Catchment Hydrology, Centre for Catchment and In-stream Research – Griffith University
Associated agencies:	State Government agencies
Further information:	Siwan Lovett, (02) 6257 3379, siwan.lovett@lwrrdc.gov.au

LWRRDC PRIORITY PROGRAMS



Redesigning agriculture for Australian landscapes

Australia's native vegetation evolved with the Australian landscape, a highly variable climate, its old soils with low nutrient levels, and fire.

But with the development of modern agriculture, this balance has shifted: introduced plants provide crops and pasture but are unable to maximise water as native plants can; and they are not as attuned to climate and soils.

The Redesigning Agriculture for Australian Landscapes R&D Program (RAAL) is comparing native and introduced landscape systems so that agricultural systems can better match the biophysical characteristics of the Australian environment. Its goals are to:

- quantify and model attributes and processes in Australian agricultural environments;
- determine the extent production systems meet environmental requirements for sustainability;
- model effects of design options for modification of production systems; and
- set design parameters for new plant production systems that meet the needs of Australian landscapes for ecological sustainability.

Major field studies are highlighting the specific differences in water use capabilities between native and introduced plant species, and functions that would need to be incorporated into agricultural systems to optimise water and nutrient uptake.

Modelling is allowing the impact of changes in agronomic practices to be assessed in terms of water and nutrient use over long runs of climate data.

Analyses of the risk of recharge at various locations across Australia are being conducted to show land managers at all levels the likely risk of groundwater recharge and nitrogen loss from current farming systems.

Benefits will include maintenance of current export benefits, improvement in fertiliser efficiencies and water quality, and more varied and pleasing rural landscapes.

Collaborating organisations

Lead agencies: LWRRDC, CSIRO

Further information: David Clarke, (03) 5348 4900,
david@effect.com.au

Social and institutional research

(Incorporating Integration and Adoption of R&D Results)

Natural resource management encompasses more than just soils, plants, animals, climate and water: it also includes how exploitation of resources is controlled through social and cultural values, economics, and political decision making. All aspects of natural resource management need to be explored in order to be able to effect change.

Availability of better technical and management options does not mean that these options will be understood or adopted. We need to know more about social and institutional underpinnings of individual and collective action, decision making and practice. We also need to generate new ideas and options for policy and decision makers and other stakeholders.

The Social and Institutional Research Program (SIRP) will:

- increase understanding of drivers and impediments to adoption of better natural resource management practices ;
- produce an information base and options for policy and management;
- enhance intellectual and professional capacities through investment in interdisciplinary research methodologies; and
- increase awareness and incorporation of R&D results into decision making and implementation processes.

The program has:

- released an evaluation framework to help catchment management committees assess processes and performance;
- developed a prototype information management system;
- reviewed adaptive management techniques and processes;
- developed a modelling shell for integrating different biophysical processes; and
- made an ongoing assessment of the agribusiness sector's role in sustainable resource use.

SIRP has links with most other LWRRDC programs.

Collaborating organisations

Lead agency: LWRRDC

Further information: Ken Moore, (08) 9388 1172,
kathken@cygnus.uwa.edu.au

PROGRAMS MANAGED BY OTHERS



Wetlands

Australian wetlands are a valuable component in the landscape. They act as filters and provide a source of biodiversity. But wetlands are at risk from water management practices, contamination, cropping and grazing practices, and pests. The Wetlands R&D Program is supporting conservation, rehabilitation, restoration and long-term sustainable development of these areas.

Completed projects in this program have:

- scoped integration of wetland R&D and onground management;
- examined and assessed the protocols for monitoring river health;
- modelled ecological responses to water regimes in arid zone wetlands; and
- investigated the availability of wetlands habitat for water birds in Australia.

The Wetlands program has now completed its three-year term of funding and the management partnership will be formally terminated when the remaining projects are complete.

Collaborating organisations

Lead agency: EA
Funding partner: LWRRDC
Further information: Bill Williams, (08) 8379 1924, bwilliam@camtech.net.au

North Australia program

Half of Australia's beef herd grazes across northern Australia where the beef industry is a major land user and agricultural enterprise. However the Asian monetary crisis and recent Queensland drought have reduced cattle prices and increased grazing pressure.

The North Australia Program (NAP) of R&D is emphasising maintenance of productivity and profitability, and an increase of sustainability. NAP targets include:

- improved ability to determine land capability, and appropriate grazing levels and strategies;
- an understanding of relationships between livestock production and ecological sustainability;
- development of effective linkages between knowledge and decision-making processes; and
- increased awareness and application of ecologically sustainable management principles.

NAP is focusing on ecological zones, and on integrating pasture and herd management into a holistic approach. Forty-four percent of northern Australian pastures are in poor or deteriorating condition: NAP is developing management systems that will maintain or improve eight key pasture types.

NAP has also been conducting R&D into woodland management, woody weed control and fire strategies and is examining off-site industry impacts.

Future work will focus on:

- long-term effects of different grazing pressures and management on pasture composition, tree/grass balance and weeds;
- nutrient movement and budgets;
- effects of grazing management on surface and sub-surface water movement;
- relationships between grazing management and key aspects of ecosystem function; and
- integration of grazing and resource management practices into efficient and profitable whole property management.

Collaborating organisations

Lead agency: MLA
Funding partners: LWRRDC, EA
Further information: Judy Lambert, (02) 9948 7862, judy@communitysolutions.com.au

PROGRAMS MANAGED BY OTHERS



Joint venture agroforestry

During the first 200 years of European settlement, 50% of Australian forests and 35% of woodlands were cleared or severely modified. Remaining forest reserves are being severely depleted or closed to logging for environmental reasons. Alternative timber sources need to be found.

One possible source is from agroforestry. While providing wood, agroforestry could also improve sustainability of Australian agriculture by providing shelter, soil conservation and improvement, and salinity prevention and reclamation. Agroforestry is currently estimated to have a potential value of about \$3.1 billion each year to Australian producers.

Agroforestry has a number of other potential benefits including:

- risk management and improved agricultural productivity for farmers;
- diversification of farm enterprises (eg. production of sawlogs); and
- reduction of the greenhouse effect.

The goal of the Joint Venture Agroforestry Program (JVAP) is to integrate sustainable and productive agroforestry into Australian farming systems so that agroforestry is practised widely. The program is seeking to:

- underpin the removal of impediments (economic, institutional and social) to adoption of agroforestry;
- provide education and cultural information to optimise investment in trees;
- ensure recognition of benefits of agroforestry;
- provide a better understanding of agroforestry systems; and
- develop guidelines and decision-making tools to assist farmers;

Collaborating organisations

Lead agency: RIRDC

Funding partners: R&D corporations—forest and wood products, land and water resources, MDBC

Further information: Roslyn Prinsley, (02) 6272 4539, roslyn@rirdc.gov.au

Sustainable grazing systems

Sustainability in agriculture is a very broad concept that has long-term time scales. It requires an understanding of the interrelationships that exist within farm production, farming systems and the broader catchment. Traditional indicators (e.g. poor animal or plant health) are inadequate since degradation is already well-advanced by the time they are obvious.

The Sustainable Grazing Systems Program (SGS) is developing indicators which are intended to:

- show how sustainable a production system is likely to be;
- raise awareness of land and water degradation issues; and
- act as early warning signs.

Such indicators must be cross disciplinary; able to be applied across systems and locations. But research has been relatively independent of actual production systems. Few indicators are adopted since they are not practical and increase the complexity of sustainability for producers.

Most application and monitoring of indicators is by larger organisations. However modern technologies such as remote sensing are not always capable of identifying subtle changes or predicting areas at risk.

SGS is developing on-farm indicators that are a part of production systems and easy to monitor. These indicators will be incorporated into best management practice for farmers, and into quality assurance systems so that industries and agribusiness are able to customise them for their unique situations.

SGS is also providing training and skills development for producers through PROGRAZE®. It has set up a network of regional producer committees to determine local issues and priorities.

Collaborating organisations

Lead agencies: MLA

Funding partner: LWRRDC, MDBC, AFFA

Program partners: Universities, State Government departments, CSIRO, Australian Museum, producers and producer groups

Further information: Warren Mason, (02) 6363 1249, warren@rpcsolutions.com.au

OTHER LWRRDC PROGRAMS



River health

Environmental flows of water in Australian rivers are currently a hotly-debated topic. The environment needs water, but how much water and how often it should receive it, is rather more uncertain.

The National River Health R&D Program (NRHP) has been developing physical, chemical and biological tools to assess and monitor river health and to assist in determining the environmental flows needed by the river landscape.

Outputs from NRHP include:

- the Australian River Assessment Scheme (AUSRIVAS);
- an upgrade of taxonomy and development of an associated CD-ROM for identification of Australian macroinvertebrates;
- alternative methods of river health assessment;
- review and best practice framework of environmental flow techniques;
- ecological impacts of stream salinity;
- evaluation of water-trading practices; and
- an environmental flows decision support system.

Phase II of this program is being funded and managed by Environment Australia.

Collaborating organisations

Lead agency:	LWRRDC (Phase I)
Funding partners:	EA
Associate:	Water Services Association of Australia
Sub-program:	MDBC
Further information:	Peter Davies, (03) 6225 4660, p.e.davies@utas.edu.au

Eutrophication Management

Algal blooms have become an unwelcome feature of Australian water systems. Blooms are toxic; and can clog water supplies; be unpleasant to smell and sight; and kill fish. Algal blooms impact on recreation areas, shellfish industries and water supplies. Their cost to Australia is estimated at \$200m each year and Australia's image as clean and green suffers from every reported occurrence.

Algal blooms are caused by excess nutrients, flow regulation and changes in aquatic ecology.

The National Eutrophication Management Program (NEMP) goal is to develop an understanding of causes of eutrophication which will help managers reduce frequency and severity of algal blooms. It aims to:

- understand the sources, transport and bioavailability of nutrients;
- understand all the factors involved in initiating and maintaining blooms;
- develop techniques and guidelines suitable for managers;
- develop guidelines for the ecological management of reservoirs; and
- assess the significance and management implications of sediment nutrient sources.

Achievements include:

- an understanding of the movement of phosphorus in the landscape;
- modelling of nutrient release from river sediments;
- a rapid test for whether nitrogen or phosphorus is limiting the growth of algal blooms;
- assessment of which nutrients limit algal blooms and when this occurs; and
- historical accounting of nutrient loads.

NEMP has organised a workshop with the Water Services Association of Australia that resulted in a collation of knowledge on the effects of toxins on agricultural produce, drinking water supplies and the natural environment.

Collaborating organisations

Lead agency:	LWRRDC
Funding partner:	MDBC
Further information:	Richard Davis, (02) 6246 5706, richardd@cbr.dwr.csiro.au

OTHER LWRRDC PROGRAMS



Sustainable use of groundwater

Groundwater supplies 18% of Australia's domestic water and approximately 12% of its irrigation water. It meets the water needs of 60% of rural Australia. It is essential that the resource is used sustainably and that its quality is not compromised. But its location underground means that it often escapes notice.

Groundwater needs to become part of the whole water management cycle.

Major groundwater management issues include:

- diffuse sources of contamination;
- allocation;
- interaction with ecosystems;
- natural remediation of polluted groundwater; and
- waste disposal on land.

The Sustainable Use of Groundwater Program has:

- completed and demonstrated to managers a groundwater vulnerability assessment tool;
- developed an Australian design method for sustainable land treatment of rural industry and sewage effluent;
- examined the possible ecologically sustainable pumping rate for the Howard East Basin as a future water supply for Darwin; and
- assessed the extent of nitrate contamination across Australia.

The program plans to deliver:

- improved community awareness of groundwater contamination;
- assessment of the groundwater role in sustaining ecosystems; and
- more rapid use of research outcomes by management agencies through focused work in complex aquifer systems.

Collaborating organisations

Lead agency: LWRRDC

Associated agencies: State Government departments, National Groundwater Management Committee under SCARM

Further information: Graham Allison, (08) 8553 5320
gja@bigpond.com

Environmental management of military lands

The Commonwealth Department of Defence is committed to maintaining the environmental values of properties it manages as well as providing high quality training for its armed forces. Significant areas are those located in the tropical savannas of northern Queensland.

The R&D for Environmental Management of Military Lands Program is investigating how livestock and military training activities affect long-term sustainability of tropical savanna systems. To do this they also need to define military training within the sustainability context. This program is based at the Townsville Field Training Area.

The program is constructing decision support tools to evaluate management alternatives and is training managers in the use of those tools.

The main stakeholder in this program is the military and program findings are distributed to appropriate people in Australia. Information has also been disseminated more widely (to New Zealand and American personnel) through a workshop that covered latest developments.

Collaborating organisations

Lead agencies: DoD, LWRRDC

Further information: John McIvor, (07) 3214 2205,
john.mcivor@tag.csiro.au

OTHER LWRRDC PROGRAMS



Rangelands

Rangelands are defined as areas of semi-arid and arid regions of northern and inland Australia where domestic stock are grazed on native pastures. They cover 55% of Australia's land area and encompass wide variations in climate, soils, vegetation and land uses. Total grazing pressure in these areas is increased by kangaroos as well as feral donkeys, camels, horses, rabbits and goats.

Rangelands are complex. They are suffering from an increase in woody weeds, a decline in biodiversity and biomass of plants, soil loss, and changes to burning regimes.

The National Rangelands R&D Program takes a regional approach to rangelands management. It links R&D to regional decision-making processes and examines the relationships between productive use and ecological sustainability so that trade-offs and options can be assessed.

Major projects concentrate on:

- development of rules for use of particular landscape elements in a region;
- development of local structures to improve decision-making and management practice; and
- the potential to close major watering points to improve conservation of biodiversity.

The program is currently being reviewed and will continue only at a targeted project level.

Collaborating organisations

Lead agencies:	LWRRDC, CSIRO, State Government agencies
Funding partner:	Commonwealth Department of Transport and Regional Services
Further information:	Phil Price, (02) 6251 4669, mackellarcg@bigpond.com

OTHER R&D INITIATIVES



General Call

Most of LWRRDC's R&D investment is through its commissioned research programs. However to counterbalance any conservatism arising out of this process, LWRRDC also calls for proposals that will develop novel and untested approaches to natural resource management. This process includes support of a Postgraduate Scholarship Scheme, and a Travelling and Visiting Fellowship Scheme.

General Call projects completed in the past year have highlighted:

- development of better farm management practices to minimise soil compaction;
- assessment of water trade policies with respect to achieving environmental and socioeconomic goals; and
- impact of weeds on tree growth in plantations.

Research priorities over recent years have included:

- assessing policy processes and institutions for resource and environmental management;
- ecological and social functions that influence governance of natural resources;
- a national Audit of changes in farmers' environmental attitudes since 1991;
- Aboriginal participation in sustainable development and resource management: impediments and solutions;
- river styles as a tool for water management;
- riverine and floodplain interactions during high flow;
- meeting the need for function-based assessments of soil biological health; and
- mid-infrared spectroscopy for rapid prediction of soil properties.

Postgraduate scholarships awarded have included work on:

- understanding the recruitment biology of vegetation communities on saline soils;
- the structure, diversity and landscape function of subtropical grasslands;
- plant functional types: grazing, fire and global warming in rangelands; and
- environmental science: from independent experts to post-modern process managers.

Travelling and visiting fellowships have included work on:

- monitoring protocols for assessing impacts and restoration in highly mobile terrestrial animals;
- institutional responses to resource conflicts;
- stream stabilisation and restoration;
- assessing probabilities of natural inflows to large catchments 3–18 months in advance;
- applying lessons from the Watershed Restoration Program; and
- characterising flow systems in fractured rock aquifers.

Although some General Call projects (especially those testing novel concepts) are funded solely by LWRRDC, most include third party support.

Priorities for the 2000–01 General Call include:

- role of biodiversity in ecosystem health;
- soil health and landscape function;
- conservation planning for rivers and floodplains;
- systems synthesis at landscape and regional scales; and
- untested and innovative approaches to improve natural resources management.

The Corporation will support six new postgraduate scholarships in 2000 as well as a number of travelling and visiting fellowships.

From 2000–01, the General Call will be held every two years, the next call being in 2002.

Collaborating organisations

Lead agency: LWRRDC

Proposals involving third party support are usually favoured.

Further information: Richard Price, (02) 6257 3379, richard.price@lwrrdc.gov.au

PERFORMANCE

1998-1999

Performance against targets

R&D Investment

Joint funding

At least 80% of the LWRRDC budget is committed to programs and projects that have joint funding and close involvement from industry/resource agency partners.

Not met (72%)

The total value of partnership contributions to LWRRDC programs and projects during 1998-99 was \$37.0 m or 130% of LWRRDC's budgeted expenditure. This compares with \$34.5 m (180% of LWRRDC's budgeted expenditure) in 1997-98.

Benefit:cost

Analyses of random stratified samples of LWRRDC-funded R&D shows that mean benefits exceed costs by a ratio of at least 5:1.

Achieved (11:1)

Implementation and public benefit

Impact analyses of completed LWRRDC programs or projects shows that results are being implemented and public benefits achieved in meeting ecologically sustainable development principles.

Achieved (for Remnant vegetation program)

Review

At least five commissioned R&D programs reviewed against stated program goals and objectives.

Achieved (for Sustainable Grazing Systems, Environmental impact of pesticides in the cotton industry, Irrigation R&D, Remnant vegetation, Eutrophication management and Riparian lands programs)

NHT links

Demonstration of effective linkages with the Natural Heritage Trust.

Achieved (links to activities of the National Land and Water Resources Audit, the National Rivercare Initiative and Bushcare)

Communications

Communications strategy

Communication strategies developed and implemented for 80% or more of R&D programs receiving LWRRDC funds

Achieved (87%)

Mailing list

At least 10% increase each financial year in the number of people seeking LWRRDC newsletters, publications or other information products

Achieved (18%)

Publication of results

Key research results from LWRRDC projects publicised in appropriate ways within six months of receipt

Achieved (100%)

Management

Project objectives

Less than 5% of LWRRDC projects fail to meet their objectives without acceptable reasons.

Achieved (2%)

Expenses

The Corporation's administration expenses are kept at less than 7% of total expenditure.

Achieved (6.6%)

Total Quality Management

Total Quality Management accreditation is to be maintained.

Achieved (maintenance of ISO 9002 standard accreditation)

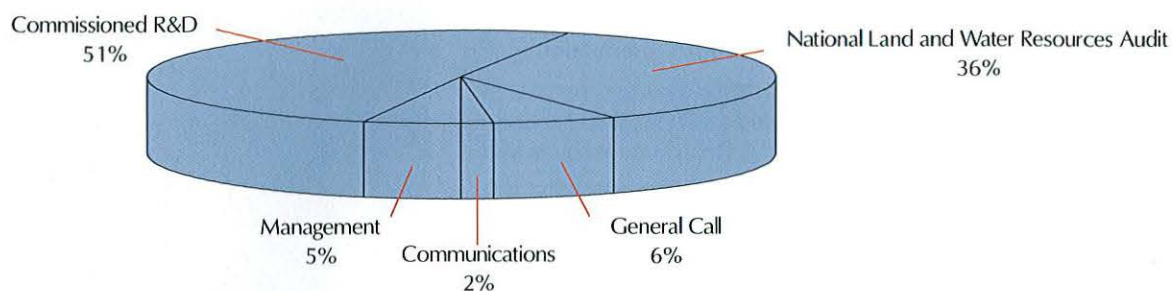
Project management

Enhanced information technology systems meet the needs of LWRRDC staff.

Not met (it is now intended that the enhanced project management system will be in place by April 2000)

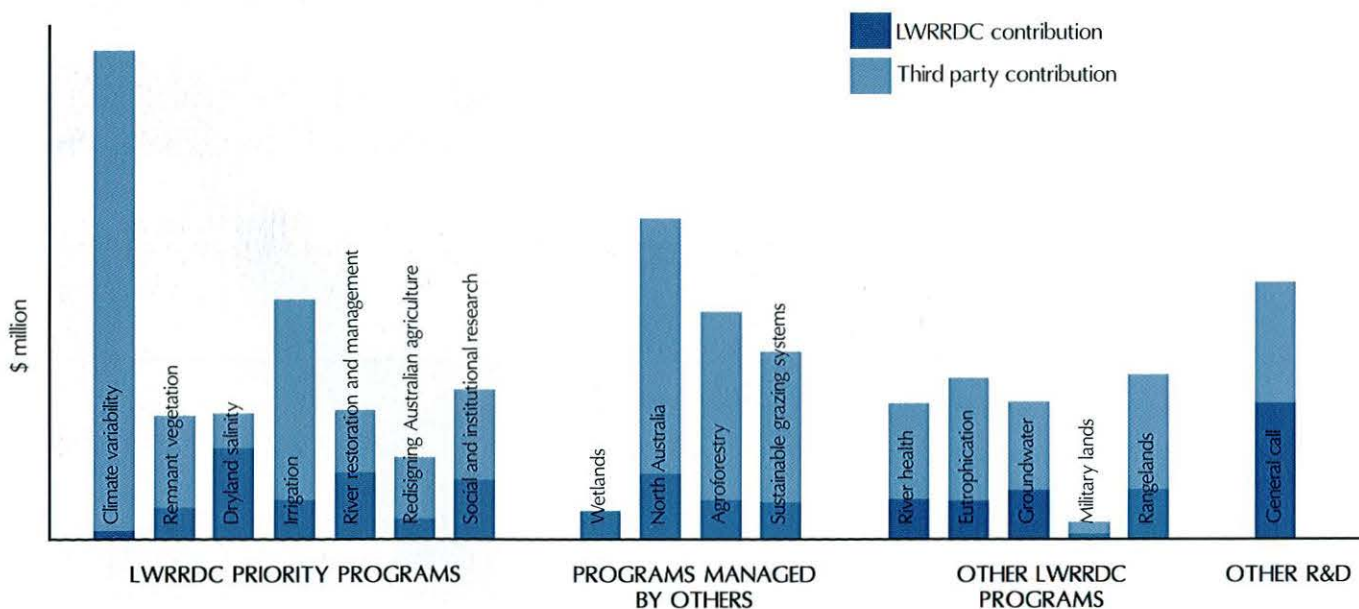


Financial performance



Leverage

Over the past year, LWRDC has achieved significant leverage from third party and in-kind contributions to its programs.



LWRRDC is working in two complementary directions. Recognising the immense scope of natural resource management, LWRRDC is focusing limited staff resources on a smaller number of areas. At the same time we are taking account of the broader scope of market, institutional, policy and political issues so that we can remain effective in natural resource management R&D.

LWRRDC recognises the need to plan and operate at the catchment or regional scale and is therefore focusing R&D at this level in order to provide sound frameworks for groups or individuals to make their own decisions.

LWRRDC is also promoting communication and liaison between researchers and onground managers and encouraging this trend into partnership in R&D programs so that:

- researchers and managers share their skills and experience;
- research activities take full account of the practical context within which management decisions are made; and
- capacity is built and managers are able to adopt and implement research findings.

This actively participatory approach and its focus on adaptive management has been incorporated into several LWRRDC programs and will be expanded in the future.

Research and development

Two new major programs are being developed:

- the National Rivers Consortium; and
- the North-West Australia Program.

The new National Rivers Consortium will attempt to maximise and coordinate efforts to protect and restore valuable riverine resources by:

- building on previous R&D;
- supporting community-based groups.
- bringing together national and State/Territory bodies responsible for river R&D and management.

The North-West Australia Program will be centred in the Ord-Bonaparte region of Western Australia. It will focus on rangelands, water resources planning and management, coastal and marine systems, indigenous planning and management and regional resource use futures. Its goal will be to assist in avoidance of the poor match of resource use to capability made in southern Australia.

LWRRDC continues to give sustainability of irrigation catchments a high priority particularly with respect to the water use efficiency principles being backed by State governments. Increasing emphasis will be given to understanding the interaction of irrigation districts with their catchments, requirements of new irrigation developments, and better application of existing and new irrigation knowledge.

F U T U R E
D I R E C T I O N S

Communications

Publishing is an ever-changing kaleidoscope of new technology and software. As a response to these changes LWRRDC has developed a new communication strategy to take it into the new century.

LWRRDC is increasing its emphasis on electronic communications by further development of websites and the use of email. This will result in publications which are less expensive in both financial and environmental costs.

LWRRDC is also enhancing its communication activities in:

- publishing accessible information such as fact sheets;
- promoting R&D results to onground users; and
- continuing its rural media awareness campaign.

Evaluation of the effectiveness of communications will also occur more frequently.

Management

LWRRDC is continuing to maintain a high level of client service. It is also applying high standards of administrative efficiency and effectiveness to its management area by monitoring and assessing outcomes.

LWRRDC will be implementing a range of improvements to its information technology (IT) systems to enable increased productivity gains in the office. IT innovations will include provision of external access to the LWRRDC project management system and the submission of electronic applications for R&D projects.

LWRRDC Strategic Plan 2001–06

Under the *Primary Industries and Energy Research and Development Act 1989*, which governs the operations of LWRRDC and other rural R&D corporations, LWRRDC is required to prepare a written R&D plan for each five-year period. Once approved by the responsible minister, this plan guides LWRRDC's operations over that period.

The plan must state LWRRDC's objectives and priorities, as well as provide an outline of strategies to be adopted in order to achieve those objectives. As a part of this process, LWRRDC's *Annual Operational Plan* (AOP) is a sub-set of the strategic five-year plan, and expresses how the objectives of the strategic plan are to be achieved in that particular year. The third component of this strong accountability mechanism is the annual report in which LWRRDC is required to report against objectives and performance indicators of the AOP, and more broadly against those of the strategic plan.

The current LWRRDC R&D Plan will cease at 30 June 2001. Early in 2000, LWRRDC's Board will commence preparation of a new strategic plan for the period 1 July 2001 to 30 June 2006. Key steps of this process have been defined, and the aim is to have a new plan ready for submission to the Minister for Agriculture Fisheries and Forestry – Australia by the end of September 2000. We will be writing to major stakeholder groups early in 2000 to seek their advice and participation in the planning process. We will use the World Wide Web to enable as many people as possible to provide their thoughts and suggestions to assist the planning process, and to comment on the results of our planning work as it progresses.

With the growing awareness of the need for a catchment approach and an understanding of more than just the biophysical issues in natural resources management, the LWRRDC Board will need to address a wider range of issues in the new strategic plan. These issues include:

- behavioural change;
- social and institutional factors; and
- an integrated systems approach.

If you want to input into the strategic plan and are not contacted directly as part of our planning process, we invite you to look at our web site (www.lwrrdc.gov.au) to find out how to present your views and ideas.

Directors

Chairperson

Alex Campbell

Alex Campbell has farming interests which include sheep, cattle and farm forestry. He is a member of the Western Australian Water and Rivers Commission Board, and is the former Chairman of the WA Farm Forestry Taskforce and the WA State Landcare Review. He is Chair of the WA Salinity Council and is also a former General President of the WA Farmers' Federation and Board member of Landcare Australia Limited and Greening Australia.

Deputy Chairperson

Warwick Watkins

Warwick Watkins is Director-General of the NSW Department of Information Technology and Management, which also encompasses forestry policy and structural adjustment, land titles and the roles of Valuer-General and Surveyor-General. He is a Foundation Director of Landcare Australia Ltd and has been Vice-President of the World Association of Soil and Water Conservation.

Executive Director

Andrew Campbell

Andrew Campbell commenced as Executive Director of LWRRDC 31 January 2000. Prior to this appointment, Andrew managed the Bushcare program in Environment Australia. He grew up on a family sheep farm, which he still manages from a distance (now in farm forestry rather than wool production), in Western Victoria. Andrew was Australia's first National Landcare Facilitator (1989–92). From 1984–8 he managed the Potter Farmland Plan Project: developing and applying the concept of whole farm planning to 15 demonstration farms. Andrew is a Board Member of the Rural Extension Centre of the University of Queensland, a member of the CSIRO Land and Water Sector Advisory Committee, and a member of the Strategic Research Committee of Meat and Livestock Australia. His professional interests include rural sustainability, management of Australian landscapes and stakeholder engagement.

Government Director

Charles Willcocks

Charles Willcocks is Assistant Secretary in the Natural Resource Management Policy Division, Competitiveness and Sustainability Group of Agriculture, Fisheries and Forestry – Australia. He has a background in agricultural commodity policy and natural resources management policies and programs.

P E O P L E

Members

Jason Alexandra

Jason Alexandra has broad experience in conservation, agriculture, horticulture and forestry. He operates a consultancy business specialising in environmental and natural resource management, and has authored numerous reports and publications in these areas.

Leith Bouilly

Leith Bouilly is a primary producer of sheep and cattle in Queensland, is Chairperson of the Murray-Darling Basin Community Advisory Committee, a member of the Australian Landcare Council and was previously a Commissioner of the Australian Heritage Commission.

Stuart Bunn

Stuart Bunn is Associate Professor in Ecology and Director of the Centre for Catchment and In-Stream Research at Griffith University, Brisbane. He has extensive experience in the research, function and management of aquatic ecosystems in tropical, temperate and arid area streams.

Sheila Donaldson

Sheila Donaldson has a background in family farming near Moree and Gunnedah, and is a registered farm planner doing consultancy work in agriculture, encompassing catchment and property planning, vegetation management, property evaluation and financial planning.

Michael Logan

Michael Logan is a cotton, cereal and beef producer from Narrabri, NSW. He has achieved full ISO 14000 accreditation for his farming operations, a first for Australia.



Officers

Andrew Campbell	Executive Director (from February 2000)
Richard Price	Program Manager—Land Resources
Nick Schofield	Program Manager—Water Resources
Sandy Lolicato	Business Manager
Glenn Conroy	Communication Officer
Joy Sutton	Communication Officer (LWRRDC and NDSP)
Kerri Morson	Executive Officer—Finance & Administration and Quality Manager
Bobbie Heath	Executive Assistant
Chris Louis	Executive Assistant
Gill Whiting	Executive Assistant
Melanie King	Executive Assistant (part time)
Betsy Vucetic	Administrative Assistant
Rebecca Barnes	Finance Officer (part time)
Maxine Nichols	Finance Assistant (part time)

R&D Program Coordinators

Graham Allison	National Groundwater R&D Program
Roslyn Prinsley	Joint Venture Agroforestry R&D Program
David Clarke	Redesigning Agriculture for Australian Landscapes R&D Program
Peter Davies	National River Health R&D Program
Richard Davis	National Eutrophication Management Program
Judy Lambert	North Australian Program of R&D
Siwan Lovett	River Restoration and Management R&D Program – Riparian Lands
John McIvor	R&D for Environmental Management of Military Lands Program
Warren Mason	Sustainable Grazing Systems R&D Program
Ken Moore	Social and Institutional Research Program
Nicholas Newland	National Dryland Salinity Program
Brett Tucker	National Program for Irrigation R&D
Barry White	Climate Variability in Agriculture R&D Program
Bill Williams	National Wetlands R&D Program
Jann Williams	National Remnant Vegetation R&D Program



Officers

Andrew Campbell	Executive Director (from February 2000)
Richard Price	Program Manager—Land Resources
Nick Schofield	Program Manager—Water Resources
Sandy Lolicato	Business Manager
Glenn Conroy	Communication Officer
Joy Sutton	Communication Officer (LWRRDC and NDSP)
Kerri Morson	Executive Officer—Finance & Administration and Quality Manager
Bobbie Heath	Executive Assistant
Chris Louis	Executive Assistant
Gill Whiting	Executive Assistant
Melanie King	Executive Assistant (part time)
Betsy Vucetic	Administrative Assistant
Rebecca Barnes	Finance Officer (part time)
Maxine Nichols	Finance Assistant (part time)

R&D Program Coordinators

Graham Allison	National Groundwater R&D Program
Roslyn Prinsley	Joint Venture Agroforestry R&D Program
David Clarke	Redesigning Agriculture for Australian Landscapes R&D Program
Peter Davies	National River Health R&D Program
Richard Davis	National Eutrophication Management Program
Judy Lambert	North Australian Program of R&D
Siwan Lovett	River Restoration and Management R&D Program – Riparian Lands
John McIvor	R&D for Environmental Management of Military Lands Program
Warren Mason	Sustainable Grazing Systems R&D Program
Ken Moore	Social and Institutional Research Program
Nicholas Newland	National Dryland Salinity Program
Brett Tucker	National Program for Irrigation R&D
Barry White	Climate Variability in Agriculture R&D Program
Bill Williams	National Wetlands R&D Program
Jann Williams	National Remnant Vegetation R&D Program



NATIONAL LAND AND WATER RESOURCES AUDIT

Overview

The National Land and Water Resources Audit (Audit) is now approximately halfway through its four-year planned life.

During this time it has identified and defined seven major areas as themes for further investigation. Within these themes some 80 projects, providing data and methods that underpin the audit of Australia's natural resources, are now in progress. The Audit is aware of the larger picture of natural resources management landscape and projects are integrated across themes so that catchment and overlapping issues are not lost. Projects also cross biophysical, social and economic boundaries.

Outputs of many Audit projects are inputs into other projects. In order to produce a coherent and timely product the Audit is ensuring that projects have been carefully designed to take care of any dependencies between projects and themes.

The Audit is also trialling and demonstrating potential Audit outcomes at State/Territory, regional and catchment scales through its implementation projects. The seven projects cover water resources assessment, natural resource inventory data, vegetation mapping, rangelands assessment, decision-support systems, land use impacts and catchment health.

Data is an important issue for the Audit and its partners. Agreements are being set up across Australia for sharing natural resources data so that future datasets are consistent and repeatable, and data-handling is minimised. Fundamental datasets (state boundaries, roads, etc) are also being compiled to meet project needs.

Audit products to date include:

- a database of soils properties that will improve access to and quality of information over Australia's cropping lands;
- land use mapping that combines biophysical and socioeconomic data to support natural resources management and provide information for planning and development;
- a data library for data storage and access; and
- a natural resources atlas to display and make accessible natural resource information.

The Audit was set up to scope the auditing of Australia's natural resources into the future. Following its nominal conclusion in June 2001, the Audit will have a further year to ensure integration of its products into existing systems and organisations so that findings continue to be of use. Accordingly the Audit has now published a document (*the Integration blueprint*) which outlines and facilitates how this process will take place, and specifies linkages and issues associated with integration of Audit activities.

In line with its brief, the Audit is continuing to promote partnerships across a range of natural resource organisations (with Commonwealth, State and Territory agencies, CSIRO, the Australian Institute of Marine Science, several CRCs, the Great Barrier Reef Marine Park Authority, universities, the community through Landcare and Catchment Management Committees and industry). These partnerships mean that Audit activities have a greater breadth

of competency and skills and will ensure Audit outcomes are relevant to stakeholders.

Collaboration with other organisations has also resulted in a greater total investment budget than would otherwise have been possible since many partner organisations are giving payment in kind for project and other work.

Audit outputs for 1998–99 include the:

- commencement of seven State-based implementation projects providing practical applications of Audit activities;
- completion of the *Integrated Assessment Process and Guidelines for Water Resource Development* providing a framework for assessing water resource development opportunities;
- completion of theme and data management work plans guiding and specifying Audit contract investment in projects and their interaction to produce final products;
- letting of most project contracts for Audit themes and data management;
- compilation of framework datasets;
- specification and letting of contracts for land use mapping; and
- specification and letting of a contract for the Australian Soil Resources Information System—providing compilation and modelling of soil properties; and a seamless, digitised cover of soil resources in Australia's cropping regions.

Collaborating organisations

Collaborative ventures are being negotiated as part of the work planning for all themes. Implementation projects under way with States and Territories demonstrate how this collaboration will occur.

Further information: Audit Communication (02) 6257 9516
AuditInfo—an electronic mailing list subscribed to from the website. Coverage includes the latest additions to the site, Audit news and program progress.

Officers

Colin Creighton	Executive Director
Warwick McDonald	Technical Director
Stewart Noble	Technical Manager, Data
Jim Tait	Technical Manager, Data
Maria Cofinas	Technical Adviser, Data and Vegetation
Rochelle Lawson	Project Officer, Methods
Sylvia Graham	Executive Assistant



FINANCIAL INFORMATION (1)

Expenditure on R&D during 1998–99 and budget expenditure for 1999–2000 (\$,000)

R&D Activity	Expenditure 1998–99	Budget 1999–00
PRIORITY PROGRAMS		
Climate variability	2,323	1,726
Remnant vegetation	869	387
Dryland salinity	1,355	1,851
Irrigation	1,555	1,933
River restoration and management	1,168	1,549
Redesigning Australian agriculture	258	437
Social and institutional research	791	1,512
Sub-total	8,319	9,395
PROGRAMS MANAGED BY OTHERS		
Wetlands	357	150
North Australia program	862	515
Joint venture agroforestry	513	515
Sustainable grazing systems	482	260
Sub-total	2,214	1,440
OTHER LWRRDC PROGRAMS		
River health	1,044	381
Eutrophication	1,006	758
Groundwater	636	626
Military lands	237	71
Rangelands	679	674
Sub-total	3,602	2,510
GENERAL CALL	1,843	1,551
NATIONAL LAND AND WATER RESOURCES AUDIT	10,282	11,273
TOTAL—R&D FUNDING	26,260	26,169

Notes

- (1) Please refer to the LWRRDC *Annual Report 1997–98* if you require comprehensive details of financial information

The following items were published in 1999. For a full listing of all available LWRRDC publications, please refer to the LWRRDC WebSite at www.lwrrdc.gov.au under Publications.

Publications for sale are available by contacting the AFFA Shopfront on 1800 020 157. Free publications are available from LWRRDC. Publications marked 'CIU' are available from Environment Australia's Community Information Unit on 1800 803 772.

Some publications are now also available from the website. Note that those marked with an asterisk (*) are only available from the website (or as a photocopy-on-demand from the AFFA Shopfront).

General occasional papers (ISSN: 1320-0992)

OP23/99	Greenhouse, carbon trading and land management Hassall & Associates	\$10
OP22/99	A Phytoplankton Methods Manual for Australian Freshwaters R. Croome & G. Hotzel	\$20
OP20/99	SEEM (Simple Estuarine Eutrophication Models) User's Manual J. Parslow, A. Davidson & J. Hunter	CIU
OP19/99	Estuarine Eutrophication Models J. Parslow, J. Hunter & A. Davidson	CIU
OP17/99	Assessing the Ecological Health of Estuaries in Australia D. Deeley & E.I. Paling	CIU
OP16/99	A Physical Classification of Estuaries M.J. Digby, P. Saenger, M.B. Whelan, D. McConchie, B. Eyre, N. Holmes & D. Bucher	CIU
OP15/99	Sediment Chemistry Macroinvertebrate Fauna Relationships in Urban Streams N. O'Connor, K. Lewin, S. Moore & E. Bradshaw	CIU
OP07/99	Limiting Nutrient Workshop 1997 A. Robertson	\$15
OP08/99	Basic Decision Support System for Management of Urban Streams – Development of the Classification of Urban Streams (Urban Water Report 1) J. Anderson	CIU
OP06/99	Evaluation of the Impact of the National Remnant Vegetation R&D Program P. Chudleigh et al.	\$15
OP03/99	Contamination of Australian Groundwater Systems with Nitrate P. Bolger & M. Stevens	\$20
OP02/99	Exploring the Future Requirements for Managing Australia's Natural Resources: Remnant Vegetation P. Chudleigh & R. Johnston	\$10
OP23/98	Minimising the impact of pesticides on the riverine environment: key findings from research with the cotton industry – 1998 conference N. Schofield & V. Edge (eds)	\$20
OP22/98	Dryland Salinity R&D Foresighting Analysis D. Alexander, B. Williams & R. Trewin	\$20

PUBLICATIONS

Impacts of research series (ISSN 1328-4320)

IR03/99 *	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1995-96 Group; Phase 2) ACIL Consulting	\$8
IR01/99 *	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1998 Series) Atech Group Pty Ltd	\$15
IR01/98	Ex-Ante Evaluation of Selected Research Projects 1997 P. Sloane	\$20

Climate variability program occasional paper series (ISSN 1324-7328)

CV02/99	Agricultural Climate Research and Services in Australia D. White, G. Tupper & H. Mavi	\$15
CV01/99	Climate variability and drought research in relation to Australian agriculture D. White, G. Tupper & H. Mavi	\$20

Other publications

Annual Report 1998-99	\$5
Stakeholders Report 1998	FREE
Listing of LWRRDC-Funded R&D: Current Projects and Final Reports 1999	\$5

Land

SHEF (Self-Help Evaluation Framework for Integrated Catchment Management)	\$20
---	------

Water

NPIRD Program Plan 1999-2002	\$5
------------------------------	-----

Vegetation

Riparian Land Management Technical Guidelines - a 2 volume set S. Lovett & P. Price (eds)	\$25
---	------

Bushcare

RR 3/99	Conservation hindered C. Binning & M. Young	CIU
RR 2/99	Opportunity denied E. Cripps, C. Binning & M. Young	CIU
RR 1/99	Beyond roads, rates & rubbish C. Binning, M. Young & E. Cripps	CIU

Newsletters

INTERSECT (LWRRDC's general newsletter) (ISSN 1326-2475)	FREE
CLIMAG (newsletter of the Climate Variability in Agriculture R&D Program) (ISSN 1441-7987)	FREE
Focus (newsletter of the National Dryland Salinity Program) (ISSN 1321-4381)	FREE
RipRap (newsletter of the Riparian Lands R&D Program) (ISSN 1324-6941)	FREE
WaterWheel (newsletter of the National Irrigation R&D Program) (ISSN 1324-4604)	FREE
Rivers for the Future (magazine of the River Restoration and Management R&D Program) (ISSN 1325-1953)	FREE

Title: Name:

Organisation:

Job title:

Division:

Postal address:
..... Postcode:

Telephone: ()

Facsimile: ()

Email:

Web site:

REPLY PAID 641
LWRRDC
GPO Box 2182
Canberra ACT 2601



No postage stamp required if
posted in Australia



Please fold along dotted lines and secure edges before posting

NATIONAL LAND AND WATER RESOURCES AUDIT

INFORMATION PRODUCTS ORDER FORM

The Audit is committed to providing information to its stakeholders. All our information products are available electronically on the Audit website at www.nlwra.gov.au. Subscribers to our electronic mailing list—*AuditInfo*—are automatically advised of updates to our website. To sign up, fill in the *AuditInfo* electronic subscription form on the website. If you want specific printed materials posted to you, or wish to receive printed material on an ongoing basis from the Audit, please fill out the form below.

Audit information

Tick the relevant box below to receive:

☐ Audit information pack

or to receive information on Audit themes:

☐ Theme 1. Water availability

☐ Theme 2. Dryland salinity

☐ Theme 3. Vegetation management

☐ Theme 4. Rangelands monitoring

☐ Theme 5. Productivity and sustainability

☐ Theme 6. Capacity for change

☐ Theme 7. Catchment and landscape health

Indicate how you prefer to receive information:

☐ post

☐ email (information in addition to *AuditInfo*)

Please mail, email or fax completed form to:

REPLY PAID 914

National Land and Water Resources Audit

GPO Box 2182

Canberra ACT

Facsimile: (02) 6257 9518

Email: info@nlwra.gov.au

Contact details

Please tick one box.

I wish to be added to the Audit mailing list

☐

I wish to remain on the Audit mailing list, but my:

• company name has changed

☐

• address has changed

☐

I would prefer not to remain on the Audit mailing list

☐

The addressee has left this organisation. Please note:

• forwarding address

☐

• replacement contact

☐

Title: Name:
(first name) (last name)

Organisation:

Job title:

Division:

Postal address:

..... Postcode:

Telephone: () Facsimile: ()

Email: Website:

REPLY PAID 914
National Land and Water Resources
Audit
GPO Box 2182
Canberra ACT 2601

National Land and Water Resources Audit
A program of the Natural Heritage Trust

No postage stamp required if
posted in Australia



National Land and Water Resources Audit

A program of the Natural Heritage Trust

Please fold along dotted lines and secure edges before posting



**Land & Water
Resources**
Research &
Development
Corporation

LWRRDC
Level 2
LINISYS Building
91 Northbourne Avenue
Turner ACT 2612

GPO Box 2182
Canberra ACT 2601

Telephone: (02) 6257 3379
Facsimile: (02) 6257 3420
Email: public@lwrrdc.gov.au
WebSite: www.lwrrdc.gov.au

Printed on Australian 50% recycled paper.



**Quality
Endorsed
Company**

ISO 9002:1994
Lic QEC 6505 (Standards Australia)