

# FOCUS on salt

The Newsletter of Australia's National Dryland Salinity Program

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## Lower the water table — problem gone?

By Bruce Munday

Rising groundwater is the driver of dryland salinity, so understandably much of our effort is devoted to arresting and if possible reversing this trend. However, recent National Dryland Salinity Program supported research by a CSIRO team led by Dr Rob Fitzpatrick shows that as saline groundwater retreats it can leave important management issues in its wake.

In a report presented to the NDSP Operations Committee, Fitzpatrick points out that little has been known about the physico-chemical changes that occur in saline soils when drained or disturbed. This is partly because saline soils have generally

been considered of little agricultural value, but also because some saline landscapes are beyond recovery.

However, the issue becomes more significant as land managers attempt to 'dry out' soil profiles by replacing annual crops and pastures with perennial vegetation, by engineering works, or when grazing animals cause erosion on waterlogged sites.

The CSIRO team studied 17 paired sites in eight different Groundwater Flow Systems across southern Australia. There they measured soil physical, chemical and mineralogical properties, comparing salinised sites with those no longer salinised as a result of intervention. From this data they developed a classification scheme for identifying 22 different types of saline soil.

Land managers and their advisers will find particularly useful the conceptual

[continued on page 2](#) ▶

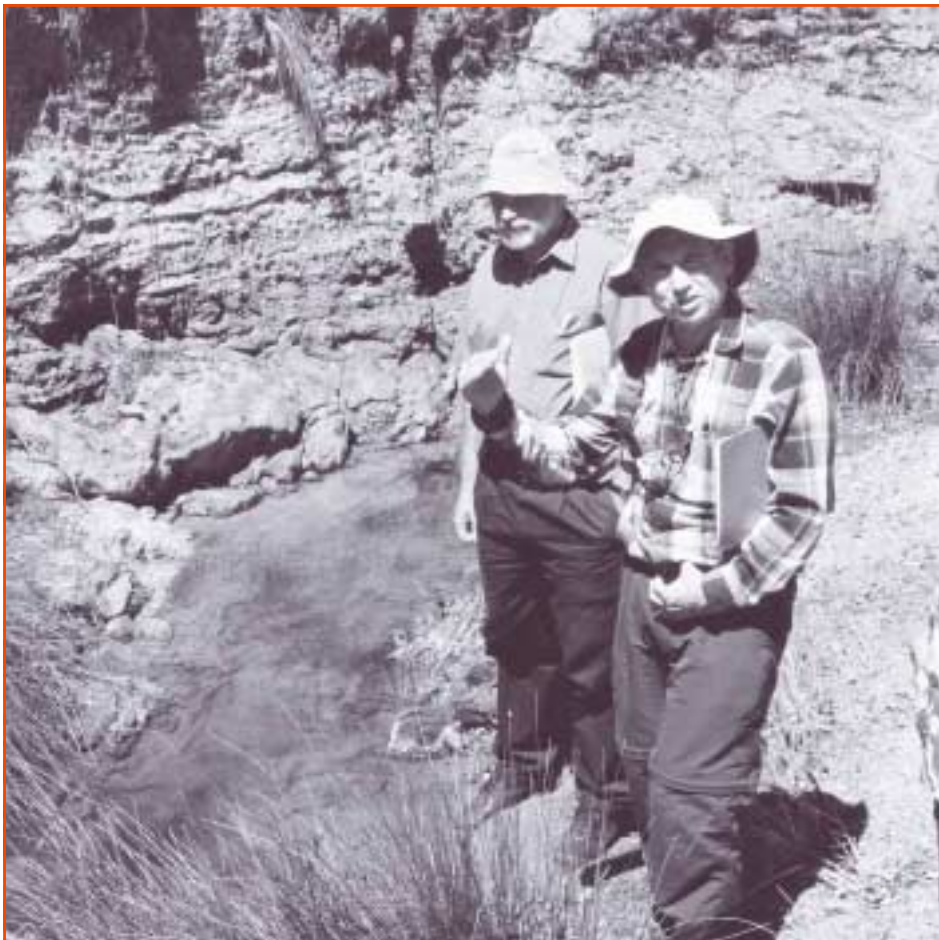


Photo: Bruce Munday

A new research report from Australia's National Dryland Salinity Program reveals that lowering saline groundwater can leave a number of important management issues in its wake.

Above: Ian Willett (ACIAR) and author of the report, Rob Fitzpatrick, at Herrmann's catchment in South Australia. Management systems to lower groundwater may require consideration of physico-chemical changes that occur in saline soils when drained or disturbed.

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## Lower the water table — problem gone? from page 1

soil-regolith models developed to summarise the dominant physico-chemical changes that occur in different soils and environments where saline groundwater has been lowered.

Understanding the processes that occur enables prediction of how soils will behave when drained or otherwise disturbed. However, these processes are varied and complex and also vary between catchments. To simplify this Fitzpatrick and his colleagues decided to settle for a minimum set of three generic models that characterise the sequences of major physico-chemical changes.

An important outcome of this work is the ability to apply the concept models to the appropriate categories of saline soil. On the one hand, this enables land managers to undertake preliminary environmental risk assessment, based on key indicators, when planning to reclaim

salt-affected land. The researchers have also used the models to develop best management practices for a simplified set of saline soils.

“Our work has advanced new concepts and practical information for land managers dealing with drained or disturbed saline soils,” said Rob Fitzpatrick. “An important lesson from our work is the need for a coordinated national framework of dryland saline soils sites (including those studied here) to provide long-term data.”

Further information about the project *Biogeochemical and physical processes in saline soils and potential reversibility* go to the NDSP web-site at [www.ndsp.gov.au](http://www.ndsp.gov.au)

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# Old mines could become salt cellars



By Georgina Wilson

The Western Australian Water and Rivers Commission is considering diverting highly saline water from the Collie River East into open-cut mining pits as a short-term option to quickly lower salinity levels in the Wellington Reservoir in the State's south-west region.

The aim is to achieve potable water of 500–600 milligrams per litre total dissolved solids (mg/L TDS), or about 90 milliSiemens per metre, by 2015. This compares with a current average of 885 mg/L in the river sending 128 kilotonnes of salt a year into the dam.

About 13 different management options have been evaluated by the Water and Rivers Commission and Collie Salinity Recovery Team, in partnership with other key stakeholders. At a workshop in late November, it was concluded that no single option could achieve the target, but a combination of short, medium and long-term options, supplementing existing tree plantations could.

Tim Sparks, the Commission's Team Leader — Salinity, said the proposal could achieve significant results within 12 months.

“Diverting the river's most saline flows in late summer and early winter into the mine pits could be done quickly and relatively cheaply, so it looks to be an attractive short-term management solution,” he said.

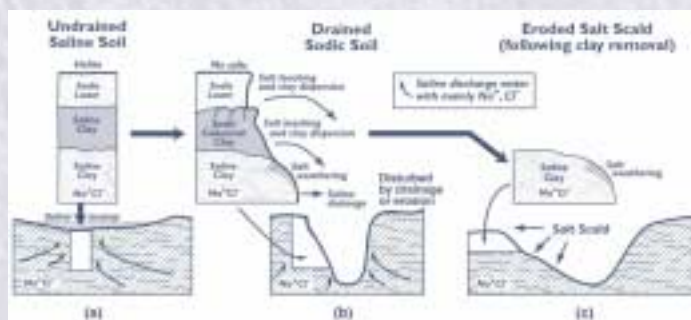
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## Generic conceptual model for soils influenced by Na<sup>+</sup> and Cl<sup>-</sup> dominant groundwaters

The primary and secondary saline soils contained sodium and chloride as the dominant ions, this stored salt originating mainly from the ocean via rainfall and marine deposition in earlier geological periods. Following the clearing of upland areas, secondary saline seepages developed through rising saline groundwater tables.

As these soils dry out, halite (sodium chloride) appears as the main salt efflorescence (halitic saline soils). This is illustrated in Figure a. When these saline soils are drained and leached by rainfall, secondary sodic soils develop (Figure b). The development of sodic layers with low hydraulic conductivity and high bulk density restricts the downward movement of water, leading to waterlogging, tunnel erosion and enhanced lateral movement of water and colloids into streams.

Eventually a saline scald will form (Figure c). When saline soils are leached, salt efflorescences on the soil surface dissolve (Figure b). Salt crystals develop at depth in the sodic soils where saline groundwater discharges through the subsoil clay layer into gullies or drains. This causes stream banks to erode by salt weathering (Figure b and Figure c).



Soil-landscape model showing the progressive transformation of saline soil (a), via a sodic soil (b), to a saline soil in salt scald (c)

# GIS underpins major salinity science initiatives

By Mark Warnick

The end product was an A4 map with five shades of colours, each representing Salinity Hazard across a basin spanning 142,000 square kilometres of Queensland.

It has been reproduced thousands of times and mailed to thousands of landowners throughout the Basin... and been reported on extensively in national, state and local media outlets. The worth and value of it has been debated extensively by stakeholder groups.

On the surface: a map. However, underpinning it has been one of the most extensive and most successful uses and integrations of GIS technology undertaken in Queensland.

The Queensland Salinity Hazard Mapping process, scientifically peer-reviewed by Australia's leading science agencies, has been used in both the Queensland Murray-Darling Basin and the Fitzroy Basin.

The five colours signifying Salinity Hazard were: grey representing low, light yellow representing low-moderate;

yellow for moderate; orange for moderate-high and red for high.

Easy! Well, for the casual recipient or the non-discriminatory, it may appear to be.

Conceptually, the intent of salinity hazard mapping is to identify those combinations of biophysical attributes that lead to a greater inherent capacity for the mobilisation of salts.

By common consent, the authors identified the fundamental components of potential for salt mobilisation as:

- Regolith salt store — how much salt is present?
- Recharge capacity — how much water is available to drive mobilisation?
- Discharge potential — is there potential for that salt to discharge to the surface or streams?

The authors stated: "All attempts to model salinity hazard must attempt to address these principal components

both at the driver level and at the level of attributes that contribute to these components."

The conceptual framework incorporated recent advances in understanding of Groundwater Flow Systems.

Spatial representations of biophysical attributes are represented as grids, which can be mathematically manipulated and statistically apportioned. A simple five-class system was used to assign a salinity hazard

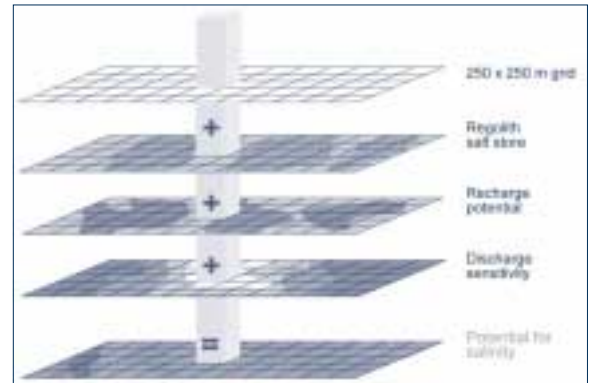


Figure 1: Conceptual diagram of the salinity hazard mapping process. The three principal component layers are added in the raster calculator to give a final hazard rating.

ranking to data in all the data layers, with Quantile splitting used to apportion the final hazard classes.

This process will now be applied to all major catchments in Queensland under the National Action Plan for Salinity and Water Quality.

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## FLOWTUBE nearing completion

By Georgina Wilson

An all-States road trip by project co-ordinator Christopher Clarke in late 2002 is now resulting in final modifications to the FLOWTUBE program, aimed to become the ultimate tool for hydrologists who are 'computer-modelling dummies'.

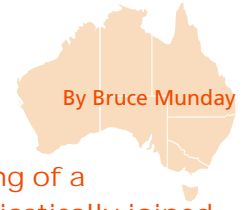
FLOWTUBE has undergone development over the last two years through an NDSP research project, aiming to produce a 'click and drag' groundwater-modelling tool that can be applied throughout southern Australia.

Prototypes have been used by hydrologists for some time, and the suggestions and ideas raised at recent meetings will be incorporated into its final format.

One of the major improvements now being finalised is the extension of FLOWTUBE from a one-dimensional to a two-dimensional tool. This will make it much more useful within catchments and enable salt-affected areas to be expressed as a percentage of catchment area instead of merely the percentage of the FLOWTUBE length.

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# A Million Hectares for the Future



Dryland farming practices on South Australia's Eyre Peninsula have undergone something of a revolution over the past decade. So it is no surprise that farmers at Edillilie have enthusiastically joined the Grains Research and Development Corporation's NDSP project, *A Million Hectares for the Future*.

This project, involving grain farmers across SA and Western Australia aims to develop on-farm management that will result in improved production, profitability and environmental outcomes through more effective use of rainfall. A critical outcome of this process will be a reduction in recharge.

The Edillilie Landcare Group, in the Cummins–Wanilla Basin on lower Eyre Peninsula, embraced *10<sup>6</sup> ha* in 2001 and set up a 22 ha trial site to assess neutral recharge farming systems. The site has been developed to explore agronomic options that could be evaluated in terms of yields and water use over a period of years and seasonal conditions.

Peter Treloar, a member of the Landcare group, says: "A few years ago we were concerned that salinity, which is certainly present along drainage lines, would spread.



Photo Courtesy: R. Britton

*Million Hectares* partners: members of the Edillilie Landcare Group and Rural Solutions SA.

"Most of us now feel that the area affected is reasonably stable and that the real issue is waterlogging. This is of course closely related to excessive recharge and seriously limits productivity.

The trial plots will take some years to deliver useful results because no two seasons are alike. For instance, 2002 was a pretty good year for us because water logging was not an issue in a year that was described as a drought.

"This has been part of the appeal of this project. We really welcome the fact that the trials are occurring in our district which we believe has quite unique features and that results are being collected over several years and hence a range of seasonal conditions."

David Davenport (Rural Solutions SA), who has worked with the Edillilie group, notes: "In December 2002 a soil pit filled with water after a 15 millimetre downpour. This was not caused by surface run-off or a rising water table but would appear to result from lateral flow over the sodic clay layer.

"This sodic layer could be very significant in limiting root penetration and plant water-use, hence contributing to waterlogging and to the familiar saline discharge along drainage lines."

Two posters describing the Edillilie Landcare Group's activities can be viewed on the NDSP website at [www.ndsp.gov.au](http://www.ndsp.gov.au)

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*A Million Hectares for the Future* is having an impact across all cropping regions of SA where dryland salinity is an issue.

"A major thrust of our work has been to improve growers' understanding of recharge management and at the same time provide them with realistic options that are both profitable and can be integrated into existing farming systems," says Project Leader Ross Britton.

"Soil pits are an important learning tool that most farmers respond to. We have contributed to soil pit days at several sites across the State, where we attempt to relate the soil characteristics to landscape features, groundwater behaviour and potential production.

The *10<sup>6</sup> ha* program also energetically promotes the role and opportunities for lucerne as a perennial component of cropping systems.

"Many grain farmers have distant memories of lucerne due to its demise under aphids in the late 1970s," says Ross. "However, they have generally been impressed with what they have seen on 'lucerne drives' and with improved livestock returns, increasing herbicide resistance and the need to improve profits on poor sandy soils, they are showing a renewed interest in 'the king' of fodders."

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# *Silent Flood* a ratings winner in December

The stunning ABC-TV documentary *The Silent Flood* proved to be a significant tool for communicating the causes, effects, implications and management options surrounding dryland salinity to a wide and varied audience when screened during December 2002.

ABC Education produced this four-part series with the assistance of the NDSP and key NDSP funding partners.

Executive Producer, ABC Education and Lifelong Learning, Barry Mitchell, said: "The program rated very well on Thursday, 5th December at its 8.00pm timeslot. It rated between 12–13 points in the major capitals, out-performing its predecessor *Catalyst*, which made it equal second in the overall household ratings.

"This figure means the program was watched by 12–13 per cent of households owning televisions in Sydney, Melbourne, Brisbane, Perth and Adelaide, with a total audience in these five cities of 864,000 people. The percentages in regional areas appear to be approximately the same.

"This is a very good result for the ABC and an excellent result for the NDSP — and for communicating the messages about salinity, particularly in metropolitan areas."

A link to *The Silent Flood* web-site can be found on the NDSP web-site ([www.ndsp.gov.au](http://www.ndsp.gov.au) — look under 'Update' or 'Publications') where further background information is available, including interviews with people featured in the



The NDSP-sponsored television documentary *The Silent Flood*, narrated by David Wenham, proved a ratings winner in December.

series. You can also purchase your own copy of the series by contacting ABC Tape Sales — follow the links from *The Silent Flood* web-site.

Contact: *The Silent Flood* web-site via [www.ndsp.gov.au](http://www.ndsp.gov.au)

## Better management of existing saltland pasture

Existing and potential saltland pasture species will be trialled in Western Victoria this year towards improving management techniques. Dr Malcolm McCaskill from the Pastoral and Veterinary Institute (PVI) at Hamilton will look at current best practice and likely 'best-bet' combinations for using saltland for out-of-season livestock weight gain.

Dr McCaskill will measure carrying capacity, species persistence, stock weight gains and wool growth, and soil changes such as salt build-up in the root zone.

The research will be carried out with a network of producers and a *Prograze*<sup>TM</sup> module for saltland will be developed during the project.

Also at PVI, Dr Zhongnan Nie will evaluate 89 legumes and four grasses on discharge sites and 24 grasses–herbs and 45 legumes on recharge sites in the Glenelg–Hopkins catchment towards selecting, evaluating and breeding new and better varieties.

Contact: Department of Primary Industries, PVI  
Ph: (03) 5573 0700

## Statistics reveal salinity awareness

Australian farmers have recognised salinity as an important issue and are taking steps to manage and prevent it, according to new survey data released by the Australian Bureau of Statistics.

A key finding was that nearly 30,000 farms have changed land management practices to manage or prevent salinity. The extent of salinity management practices is large, with the main reasons given for changing practices including farm sustainability, improved environmental protection and increased productivity.

The main barriers to change included lack of financial resources and lack of time. Doubts about likely success and lack of information were not barriers to the majority of farmers.

Contact: [www.abs.gov.au](http://www.abs.gov.au)

# Private agronomists support salinity workshops

By Elizabeth Madden

Wesfarmers Landmark agronomists throughout NSW are equipping themselves for an active role in dryland salinity management. Similar workshops have now also been held in South Australia and Victoria.



Photo Courtesy: DLWC, Ann Smithson

Wesfarmers landmark agronomists tackle the 'hands on' session of the Armidale salinity workshop.

During 2002, Wesfarmers Landmark agronomists participated in salinity management workshops at Tamworth and Armidale.

The positive feedback from those attending sends a strong message that private agricultural advisors want to know the latest on salinity management and that a successful product is being delivered. One participant marvelled that so many informative people could be gathered under the one roof! Further workshops are scheduled for NSW's Wesfarmers Landmark agronomists this year.

Wesfarmers Landmark employees are the first private agronomists to receive salinity training managed by NSW Agriculture, a core partner in the Co-operative Research Centre for Plant-based Management of Dryland Salinity (Salinity CRC). While priority has been given to Wesfarmers Landmark because of its financial commitment to the Salinity CRC, other private agronomists are also being targeted for training.

NSW Agriculture Salinity Advisory Officer at Tamworth, Tarnya Christian

said the knowledge gained at the workshops is vital to the people who are providing advice to farmers.

"The agronomists gain a clear understanding of the issues and a positive outlook to the management of the problem," she said.

"By being more aware of the factors that contribute to salinity, they are better able to provide advice that takes in salinity considerations and fits in with the farm plan. For example, instead of advising the farmer to long fallow, they may suggest opportunity cropping to reduce the likelihood of deep drainage."

Salinity Project Manager with Wesfarmers Landmark, Kevin Graham, applauded the training initiative and said agronomists at the Tamworth workshop indicated it was the best natural resource management workshop they had attended and they are now more conscious of salinity.

Contact: Deb Slinger, Southern Salt Action Team Leader, NSW Agriculture, Wagga Wagga  
Ph: (02) 6938 1901

## Wesfarmers Landmark donates salinity monitoring equipment

By Mark Warnick

Wesfarmers Landmark has joined the push to fight dryland salinity in Central Queensland with a donation of data monitoring equipment to the Caves Landcare group.

The company has donated an electrical conductivity meter to the group and this will be used to monitor salinity readings at a range of landowner sites in the Rossmoya/Barmoya area.

Chair of the Caves Landcare Group, Peter Baggett, said the donation of the equipment was very welcome and will help the group carry out regular monitoring and data collecting roles across a range of sites and properties.

Natural Resources & Mines Senior Land Resource Officer Bruce Forster said the data collected by the group would also be very welcome for NR&M in its ongoing campaign to tackle dryland salinity.

Wesfarmers Landmark Rockhampton Branch Manager Bernie Hoch said the company was delighted to support Landcare in this effort to improve sustainability and productivity of our rural lands.

Caves Landcare Group, Wesfarmers Landmark and Natural Resources & Mines will also be involved in major initiatives in dryland salinity management and the data gathered will assist in these.

This includes a major Dryland Salinity Training Workshop to be held in the Fitzroy River Catchment in May. This is a collaborative workshop between Wesfarmers Landmark, NR&M, the National Dryland Salinity Program and the Co-operative Research Centre (CRC) for Plant-based Management of Dryland Salinity of which Wesfarmers Landmark is a commercial partner.

# New funds for the next era in salinity science



CRC FOR  
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SALINITY

Livestock production from salt-tolerant pastures and conserving wildlife through new approaches to farming are the highlights of a new round of research to help tackle Australia's salinity crisis.

A new funding bid by the Co-operative Research Centre (CRC) for Plant-based Management of Dryland Salinity has been awarded an additional \$5 million in the latest round of Commonwealth funding.

This money is matched by \$7 million of cash funding from industry, and \$14 million of in-kind support from the CRC's research partners.

"This supplementary bid extends the reach and impact of the CRC in its efforts to tackle dryland salinity — arguably Australia's most important and complex environmental challenge," said

Professor Phil Cocks, the CRC's Chief Executive Officer.

"By mixing these new lines of work into our current research we're better able to ensure the profitability and sustainability of new ways farming — making it much more likely that landholders will take them up."

## Animal Production from Sustainable Pastures

The animal production program, which aims to increase the productivity and sustainability of livestock production using new farming systems based on

perennial plants, is headed by Dr David Masters from CSIRO Livestock Industries.

## Conservation through Sustainable Land Use

The biodiversity program, which aims to protect and restore natural environmental values in Australia's farming areas by understanding the impact of new and existing land uses on native plants and animals, is led by Dr Ted Lefroy from CSIRO Sustainable Ecosystems.

Contact: [www.crccsalinity.com](http://www.crccsalinity.com)

# Need for improved salinity information



Current salinity information available to farmers has been found lacking in a recent survey conducted in Western Australia.

Researcher Stephen Lloyd from the Department of Agriculture found that existing products were ineffective in influencing decision-making and practice change in WA due to lack of strategic planning, non-use of the Internet by farmers seeking salinity information, and lack of awareness of what was available.

Twenty-four Avon catchment land managers were interviewed for the study. Participants had to have a working farm and have taken some action to address salinity in the last year.

Generally, those interviewed thought current salinity information was impractical and irrelevant; did not use the Internet to source salinity information (although they may have been able to access it) and did not know what resources existed.

A need existed for extension agents to "write with the farmer's perspective in mind" the report said. Publications needed to supply information that was 'actionable, practical, proven and relevant' not general and impractical. Information should include case studies, and be linked to a face - someone with whom they could discuss further issues, several interviewees suggested.

Visual effects of salinity rather than printed information or public pressure were found to be the greatest motivators for farmers to address problems. Farmers reported that time and money, not just information, were constraining factors in salinity action. Even if they received all the information they needed, in ideal formats, changes in practice still might not happen.

Recommendations from the study included:

- Further study of farmers' knowledge of salinity and their information needs;
- More extension resources to support quality targeted published information;
- That future suites of salinity information include well-documented case studies and trials; and
- Salinity publishers from various agencies should form a network to learn from each other and improve output.

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# Native grasses at the landscape scale



NSW Department of Land and Water Conservation researcher Bill Johnston and his team have investigated the characteristics of native grasses that contribute to the water balance of our catchments. This has resulted in a number of recommended management strategies to optimise catchment health in agricultural zones.

In south-eastern Australia grasslands dominate the landscape. The spectrum of grasslands range from relatively undisturbed diverse communities with a range of perennial grasses, shrubs and trees to highly modified simple communities of annuals (including crops).

The main characteristics that impact the water balance are:

- *Water use in summer*— grasslands using water in summer dry the soil and reduce the potential for deep drainage to a greater extent than pastures that are summer-dormant or senescent; and
- *Impact on run-off*— cultivation, such as is necessary to establish sown pastures, increases infiltration at the expense of run-off. If this is not balanced by increased water use soils will become wetter, leading to higher rates of deep drainage.

Therefore, the conversion of native summer-growing grasslands to sown summer-dormant pastures is likely to reduce run-off, and markedly increase deep drainage.

A flexible and strategic approach toward improving grassland species diversity,

summer water use, and run-off characteristics is achieved by:

- High grazing pressure for short periods with extended rest periods in diverse grasslands;
- Heavy tactical grazing in spring to reduce fertiliser responsive annuals (which can out-compete summer-active perennial grasses);
- Maintain ground cover above 70 per cent to minimise the risk of soil erosion and reduce the risk of invasion by undesirable weeds; and
- Allow perennials to flower and set seed in early summer by removing stock.

Contact: Bill Johnston, Centre for Natural Resources, DLWC, Ph: (02) 6298 4019

## Search for native tolerant grass



The search is on in the Wimmera for native grass species that show salt tolerance and offer an alternative to tall wheat grass and other exotic grasses that have invasive potential.

The National Action Plan has funded the project to find native grasses growing in salinity discharge sites in the Wimmera.



Photo Courtesy: Natural Resources and Environment

Searching for salt-tolerant species: Greg Dennis harvesting puccinellia

Fifty discharge sites have been surveyed by botanist Austin Brown, including the Edenhope area, the Natimuk–Douglas saline wetlands and sites in the Upper Wimmera near Navarre. Sites in the Edenhope area included Lake Cogumbul, Lake Yallakar and Back Swamp where a number of species of puccinellia (saltmarsh grass) were found.

The most common native grasses found so far have been the puccinellias, distichlis (Australian salt grass), fairy grass and cane grass.

The next stage of the project will identify which species to trial under a range of soil salinities and to collect seed for the trial. A dry lake bed near Edenhope has already been harvested for puccinellia seed.

Further information: Julie Andrew, Salinity Officer, Department of Primary Industry, Horsham, Ph: (03) 5358 8902  
E-mail: julie.andrew@nre.vic.gov.au

# Biodiversity and salinity the hot topic

While much research and development is currently underway to investigate ways of reducing the risk of salinity to agriculture and the built environs, our understanding of the impacts of secondary salinity on our natural environment and biodiversity remains limited.

A landmark conference held in Albany, Western Australia in late 2002 provided many of the building blocks for overcoming this important knowledge gap. The international conference on *Prospects for Biodiversity and Rivers in Salinising Landscapes*

was organised by the CRC for Plant-based Management of Dryland Salinity and the Centre of Excellence in Natural Resource Management and sponsored in part by Australia's National Dryland Salinity Program.

Reports compiled by NDSP Communication Co-ordinators Georgina Wilson and Kim Mitchell.



Photo: Kim Mitchell

Catching up at the *Prospects for Biodiversity and Rivers in a Salinising Landscapes* conference were (from left) Richard Price, National Dryland Salinity Program; Keynote speaker and author Tim Flannery and Phil Cocks, Co-operative Research Centre for Plant-based Management of Dryland Salinity.



Photo: Kim Mitchell

Delegates at the *Prospects for Biodiversity and Rivers in a Salinising Landscapes* conference included (from left): Lindsay Bell, University of WA; Mandy Joyce, University of New England and Darren Kupke, University of Adelaide.

## Research highlights water quality management dilemma



By Kim Mitchell

Land and water managers are facing at least two threatening processes to water regimes and water quality in Australia — dryland salinity and uncontrolled plantation development.

Speaking at the *Prospects for Biodiversity and Rivers in Salinising Landscapes* international conference, Chair of Australia's National Dryland Salinity

Program (NDSP) Kevin Goss said a three-cornered contest between trees, water and salt was emerging in water resource management to achieving desirable river health.

“Commercial plantation forestry in the more secure, high rainfall areas and proposed reforestation for salinity management in the medium rainfall zone, if not carefully located, may reduce surface run-off and have potentially undesirable outcomes,” he said.

“This is complicated further by other pressures on water resources, rapid growth of farm dams, over-extraction of groundwater beyond sustainable yields and predicted impacts of climate change.

“If we want to get the best result for the

river environment and for industry we must encourage forestry and revegetation in the right place for beneficial management of salinity and water quality.”

NDSP National Manager Richard Price said new tools to overcome such management dilemmas were currently being developed by the Program and its investment partners.

Mr Price noted that at a time when Australia is facing its worst drought in 20 years, the need to protect our valuable water resources has become even more apparent.

“Many farmers and land managers may assume that because we are in the grip

continued on page 10 ►

of drought, groundwater recharge is reduced, therefore lowering water tables and salinity risk," he commented. "Because of the increased concentration of salts entering our waterways we need to be vigilant about managing salinity at all times — even through drought."

Mr Price said the NDSP supported a number of important projects of direct relevance to water quality and catchment management, investing in practical research and development to support the protection and management of our unique biodiversity, habitat and landscape amenity values threatened by dryland salinity and its impacts.

For further information, visit NDSP on-line at [www.ndsp.gov.au](http://www.ndsp.gov.au)

## Woodlands retreat from salinity



By Georgina Wilson

Waterlogging period may be a more important determinant than salt levels in the survival of some native plant communities recent NDSP research is showing. Researcher Michelle Carey has been studying yate woodlands on the Gairdner River, east of Albany in WA for three years.

Michelle found rivers in the study site proximity can be four times saltier than the ocean, but plant communities had evolved to cope. However, secondary salinity caused by land clearing is causing many changes including the retreat of woodlands in favour of samphire flats and mixed shrubland.

Michelle found that waterlogging periods and chloride levels could be useful predictors of the health and fate of remnant bushland.

The longer the hydroperiod or length of waterlogging, the fewer trees that remain healthy, and the lower recruitment of seedlings. In open yate woodland that experienced waterlogging for less than 10 per cent of the time, trees were healthy but became stressed at 20pc.

Where groundwater was less than 1.5 m below the surface for more than 80 per cent of the time and soil chloride was less than 1500 mg/kg, stressed mature yates with saplings could survive, but no saplings survived when soil chloride levels topped 2000 mg/kg. Yate-melaleuca shrubland was also healthier in sandy soil than clay at similar salt levels.

Understanding the length of time a location may be waterlogged provides the key to what community of plants it may support, she suggested.

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## Native vegetation at risk needs urgent attention

By Georgina Wilson

Setting priorities for the protection and restoration of remnant vegetation at risk from salinity and rising water tables is an urgent task, research sponsored by the National Dryland Salinity Program has concluded.

Dr Viki Cramer and Professor Richard Hobbs from Murdoch University in WA presented this idea at the conference.

While the physiological processes that confer salinity and/or waterlogging tolerance on native species were well understood, few studies in Australia had focused on how native plant communities will respond to the development of secondary salinity.

Given that remnant vegetation on Australian agricultural land is often small in extent, highly fragmented and likely to be degraded by grazing, weeds and other factors, rising water tables may deliver the final blow to maintaining their ecological activity.

Within this context, all remaining native vegetation can be considered valuable in terms of conserving diversity and providing ecosystem services to surrounding farmland.

In reality, the underlying hydrological processes driving development of dryland salinity cannot be simply or immediately reversed, the authors said. While groundwater pumping and other engineering works could maintain the hydrological integrity of natural areas, high cost meant only a small number of key reserves could be protected.

Remnants that contained critically endangered species or communities, or had high habitat value, were likely to receive high priority, regardless of the cost of protection from rising groundwater.



Photo Courtesy: Viki Cramer

Lyn Atkins, CSIRO Sustainable Ecosystems, with laser level equipment. While groundwater pumping and other engineering works could maintain the hydrological integrity of natural areas, high cost means only a small number of key reserves can be protected.

However, it is also likely that many ecologically valuable remnants will not be afforded such protection, and the health of vegetation in these remnants will decline.

As a community, priorities must be set on which remnants will be protected, which will be restored and in which remnants the progression of salinity will be allowed to occur.

Naturally saline systems might provide important signposts towards developing understanding and management approaches for vegetation at risk from secondary salinity. Understanding the dynamics of naturally saline systems would allow restoration efforts to be structured around the processes that operate in these systems.

In most cases restoration efforts must focus on restoring structure and function without necessarily restoring species composition.

The NDSP researchers have developed a set of conceptual models of the potential impacts of shallow saline water tables on ecosystem structure and process in remnant vegetation in agricultural areas, particularly the WA wheatbelt.

They suggested that fine-scale variability in surface topography and soil characteristics might play an important role in limiting the effects of rising groundwater.

Rising saline water tables also had an 'edge' effect that moved inward from

the perimeters of native vegetation over time.

Besides rising water tables, the effect of surface flows from upslope and the risk of dumping of groundwater from pumping beneath other areas could endanger remnant vegetation.

They suggested that setting priorities for the protection and restoration of remnants at risk from altered hydrology be based on an assessment of the relative threat to the remnant, its ecological and community value and the probability of the remnant's persistence or recovery.

Contact: Dr Viki Cramer, Ph: (08) 9360 7224  
E-mail: vcramer@essun1.murdoch.edu.au

**STATE ROUND-UP** a round-up of happenings in each of the States supporting NDSP. If you have any information you would like included here, contact your nearest NDSP Communication Co-ordinator listed on the back page.

## Queensland



By Mark Warnick

### Drilling data now available

Data from bore logs outlining geological and hydrological conditions from drilling program in the north-east Downs in south-west Queensland, funded by the National Action Plan for Salinity and Water Quality, has now been made available to regional natural resource management bodies as well as wider state agency usage.

Natural Resources and Mines senior hydrologist Bruce Pearce said the digital reports contained no interpretive information. "However, it is useful information that is increasingly being requested by the general community as well as salinity professionals," he said.

### Mapping prompts clearing code changes

The release of the Salinity Hazard Map for the Fitzroy Basin, in central Queensland, has prompted changes to the performance requirements for assessing vegetation-clearing applications under the Vegetation Management Act.

The codes on both freehold and leasehold land have now been slightly modified from earlier changes made following the release of the Queensland Murray-Darling Basin salinity hazard map.

This protects remnant vegetation in drainage basin areas with less than 30 per cent remnant vegetation.

The changes to the codes also protect remnant vegetation in the recharge areas with soils of medium to high permeability relative to other soils in the groundwater flow system. Regrowth is exempt as normal.

### Thirsty Queensland alerted to salinity risk

The connection between water use efficiencies and dryland salinity is increasingly obvious. Dryland salinity has the potential to severely affect quantity and quality of freshwater.

Queensland is the nation's highest per capita water user behind the Northern Territory. Use of freshwater in Queensland has increased by 97 per cent between 1983 and 1997.

However, the Queensland Government's Rural Water Use Efficiency Initiative in providing assistance to farmers to improve ways of irrigating crops, has meant more than 180,000 ML of water per year is already being saved.

### Mixing and matching for productive uses

A Queensland company specialising in developing trees for salinity control and agroforestry has highlighted one of its research projects in Victoria to illustrate a possible better land use than evaporation basins for salinity control throughout Australia.

continued on page 12 ►

Dr Glenn Dale of Saltgrow Pty Ltd said the company was currently irrigating *E. camaldulensis* x *E. globulus* and *E. camaldulensis* x *E. grandis* hybrids with pumped saline groundwater of 10dS/m near Kyabram in Victoria. The pumping is done to control water table depth then diluted for use in irrigation pastures and trees.

Saltgrow representatives spoke at the 8<sup>th</sup> PUR\$&L conference in Fremantle, WA. Proceedings are now available on the Promaco web-site; access this link through the PUR\$&L section of the NDSP web-site at [www.ndsp.gov.au](http://www.ndsp.gov.au)

A 2<sup>nd</sup> edition of the hard copy, more complete than the conference issue, is also now available from Promaco at \$33 (inc. GST).

Further details at

[www.ndsp.gov.au/40\\_pursl/pursl.html](http://www.ndsp.gov.au/40_pursl/pursl.html)

### PUR\$&L 2003 plans in place

Planning is now well underway for the 9<sup>th</sup> Productive Uses and Rehabilitation of Saline Lands (PUR\$&L) conference to be held at Yeppoon in central Queensland from 29 September to 2 October this year. Make this a firm date claimer now!

This conference represents the major salinity management conference for Australia this year. It will strongly appeal to scientists, policy, planners, landowners, community groups and government.

Contact: E-mail: [pursl@eventcorp.com.au](mailto:pursl@eventcorp.com.au)

### Salinity conversions in-hand

Queensland's Department of Natural Resources and Mines has produced a 'Salinity Converter' for widespread applications across the State. The simple, hand-held card has a sliding scale that converts units of salinity and relates the suitability of those values to crops and livestock.

Contact: Col Christiansen, NR&M, Indooroopilly  
Ph: (07) 3896 9620

### Using our rain profitably

Following a visit to Queensland NRSc to explore potential interactions between NRSc and the CRC for Plant-based Solutions to Dryland Salinity, CRC Chair Alec Campbell was reflecting on a recent trip to Adelaide.

The morning he arrived, Adelaide had just had a very heavy rain event. However, Alec was struck by the banner headline in the city's metropolitan Daily that read: "Cruel Rain."

The paper stated that the rain had come too late for annual cropping. When interviewed by the ABC that morning, he stated that this type of headline and this sentiment was the exact reason why the CRC had been formed.

"If we convert to a perennial plant-dominant system, no rain is ever cruel. The system will gladly accept all rain that falls."

### Come fly with me...

Airborne geophysics ground-truthing in the lower Balonne in Queensland is proceeding.

The project, called 'Airborne Geophysics for Salinity Planning in the Lower Balonne' is a joint state-Federal collaboration (Queensland Department Natural Resources and Mines, Co-operative Research Centre for Landscape, Environments and Mineral Exploration and Bureau of Rural Sciences) under the National Action Plan for Salinity and Water Quality.

The current phase of work involves ground truthing and a major hydrogeological investigation. Boreholes up to 160 metres have been drilled and samples are being taken and analysed.

Measurement of groundwater heights and groundwater sampling is also proceeding. In addition, shallow drillholes will be made up to 20 m depths and on-site geologists will log the material.

## New South Wales

By Lisa Gray

### Framework for Salinity R&D

The Salinity Research and Development Co-ordinating Committee (SRDCC) was established as a major action of the NSW Salinity Strategy, to provide advice on salinity research and development needs and priorities in NSW.

The SRDCC has prepared 'A Strategic Framework for Salinity Research and Development in NSW'. This document sets out key knowledge questions that need to be answered for effective salinity management in NSW.

A copy of the Framework can be accessed on-line at [www.agric.nsw.gov.au/reader/14818](http://www.agric.nsw.gov.au/reader/14818).

The SRDCC has also established a 'Register of Existing Salinity R&D Projects' with applications to NSW.

### Workshop on CATSALTv1.5 model for the Little River

Researchers from DLWC's Centre for Natural Resources met with regional and extension staff to review results from the Catchment Scale Salt Balance Model (CATSALTv1.5) on the Little River catchment.

CATSALT is a newly-developed modelling system that predicts the cumulative effects of land use change on in-stream salt loads at the catchment scale.

The predicted outcomes for catchment water and salt yield from the CATSALT model are made possible by extensive collaboration between managers, catchment modellers and the field staff of DLWC.

The model is designed to capture both the heterogeneity of the landscape and climate variability whilst ensuring it is simple enough to be applied operationally using the available data.

The model included climate and streamflow data from 1975–2000

incorporated with mapped topographic, soils, geology and vegetation data. These spatial and temporal data were used to predict outcomes for the impact of land use change scenarios on water and salt yield for the Little River.

The information presented was well received. Various components of the water and salt balance model were quantified and the results conformed to the knowledge of local experts at the meeting.

The presentation highlighted the importance of a collaborative effort in producing powerful and practical management tools.

### NSW Node meeting for CRC

The 80 members of the Salinity CRC's NSW Node met together for the first time as a group at Young in late February.

Over the two days, the NSW Node members (other nodes occur in VIC, SA and WA with QLD a possible new member) became familiar with each other, the workings of the CRC, progress in the five research programs, and plans for integrating the two new programs looking at animal production systems and biodiversity.

The CRC's current research programs include education and communication, function of natural ecosystems, new plant species, balanced land-use systems, and economic and social assessment. A

salinity tour of the Young area was also a feature during the Node Meeting.

Contact: Elizabeth Madden, NSW Agriculture  
Ph: (02) 6938 1985, Fax: (02) 6938 1995

## Victoria

By Jo Curkpatrick

### Pilot research program on salinity conducted in Edenhope

A pilot study, being run in the Edenhope area of West Wimmera hopes to offer a breakthrough in mapping saline areas. By matching salt-affected areas with characteristics in the landscape the study hopes to develop a cost effective and efficient method of mapping salinity. Three study areas covering 1500 hectares have been used for the trial.

Rob Clarke, from the Centre for Land Protection and Research, has been working on the project and is using existing datasets that describe certain characteristics of the landscape.

According to Rob, the datasets that appear to offer the best potential for identifying areas likely to be saline are the high resolution digital elevation model (DEM), developed for mineral exploration in north west Victoria, and the airborne gamma ray spectrometry data (radiometrics).

The high resolution DEM allows scientists to accurately predict landscape

characteristics such as slope, aspect, elevation, and curvature. Radiometric data provides information on soil types.

It is hoped that data from DEM and radiometrics can be matched with on-ground salinity mapping and if a relationship is found this technique can be used to predict the occurrence of previously unknown salinity.

"This method could provide a more efficient method of mapping salinity which in turn will improve environmental monitoring and allow a better assessment of the effectiveness of current programs," said Rob.

Further information: Rachel Farran, Salinity Extension Officer, Department of Primary Industry, Edenhope, Ph: (03) 5585 1131 or Rob Clarke, Centre for Land Protection Research, Bendigo, Ph: (03) 5430 4444

## South Australia

By Bruce Munday

### Wool producers unite against salt

The Sustainable Grazing on Saline Lands (SGSL) Producer Network, part of the Land, Water and Wool initiative, has been working against the seasonal clock to get the first round of research sites up this year in South Australia. Producer groups are already responding to advertisements to initiate and participate in research into local issues relating to sustainable grazing on saline land.

Contact: SA Dryland Salinity Committee  
web-site, [www.saltcontrolsa.com](http://www.saltcontrolsa.com) or  
Jock McFarlane (Rural Solutions SA),  
Ph: (08) 8762 9100  
E-mail: [mcfarlane.jock@saugov.sa.gov.au](mailto:mcfarlane.jock@saugov.sa.gov.au)

### If you must drain...

The SA Dryland Salinity Committee's Drainage Forum is set for 3 April 2003 at the SARDI Plant Research Centre.

Agenda includes:

- Context of drainage in SA;
- Integrating drainage into salinity management;
- Planning a drainage project;
- Economics of drainage;



Photo Courtesy: DLWC

The CATSALTv1.5 presentation was followed by a tour of priority salinity zones in the Orange area.

- Legal implications for drainage programs; and
- Case studies, including lessons learned from WA.

Contact: [www.saltcontrols.com.au](http://www.saltcontrols.com.au)  
 Glenn Gale Ph: (08) 8303 9345  
 Email: [gale.glenn@saugov.sa.gov.au](mailto:gale.glenn@saugov.sa.gov.au)

### Helping hand to local government

The Murray Darling Association is rolling out a three-stage project to introduce South Australian councils to the implications of dryland salinity.

The project provides councils with services tailored to their particular area:

- A risk assessment enabling them to understand the nature of the threat posed by salinity;
- Support tools for developing planning guidelines for salinity; and
- Training of local government officers and councillors to build capacity to address salinity issues.

Contact: Amy Paparella  
 Ph: (08) 8226 1733 or  
 E-mail: [amypaps@chariot.net.au](mailto:amypaps@chariot.net.au)

### Keeping up with it

A quarterly South Australian NDSP newsletter is published to coincide with *Focus on Salt*. Electronic copies can always be found on-line at [www.saltcontrols.com](http://www.saltcontrols.com)

## Western Australia

By Georgina Wilson

### Farmer groups flocking to SGSL

Twenty-two farmer groups have now been accepted into the Sustainable Grazing on Saline Lands (SGSL) project in WA following a second call for applications in October 2002. Final closing date for this round is 10 March 2003, so the number could rise again in the near future.

The nine newly-accepted groups will be visited by project staff in February and March to refine plans and develop priorities.

New projects have been submitted by wide-ranging groups, including:

- WA No-Till Farming Association (WANTFA) which wants to compare clones of river saltbush;
- Jerdacuttup Grazing Group which seeks to trial sub-tropical grasses on the south coast sandplain; and
- Gorge Rock Salties near Corrigin who want to establish native grasses and other nutritious pastures on saline soils.

Some research projects will continue for two or three years, but others extend to five years.

Research officer John Paul Collins said that local development officers from the Department of Agriculture would also be present at meetings and then become the first point of contact for the farmer research groups.

Over the next few months on-site storage boxes will be provided where a trial diary and other information will be kept. Protocols are being established and will be published soon to clarify responsibilities of both the farmer groups and project staff.

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 Department of Agriculture, Katanning  
 Ph: (08) 9821 3249 or  
 E-mail: [jpcollins@agric.wa.gov.au](mailto:jpcollins@agric.wa.gov.au)

### Early reclamation success for raised beds

Raised bed farming during 2002 outperformed conventional cropping on saline land, with installation costs returned in the first year.

In a large scale research project at Woodanilling funded by GRDC, the CRC for Plant-based Management of Dryland Salinity and the Department of Agriculture, a 100-hectare area of normally unproductive waterlogged and

saline valley floor was prepared by surveying, deep ripping and draining.

Half of the area was cropped to Stirling barley and the rest to pasture with similar areas of both raised beds and normal seedbed. Raised beds yielded 1.8 t/ha with gross margins of \$230/ha compared with 1.4 t/ha and \$169/ha for the control. Yield from both treatments should have been greater, but grain losses from frost and wind approached 40 per cent. Similar results were also obtained on canola at North Stirlings.



Thriving crop of Stirling barley on raised beds at Woodanilling, WA.

Photo Courtesy: G. Hamilton

Greg Hamilton from the Department of Agriculture said 1.4 t/ha on the normal seedbed was higher than expected due to the dry season and deep-ripping of the seedbed, which is not normal practice. This soil would subside back to normal density with lower productivity in coming years, he predicted.

Encouragingly the size of individual salt scalds was substantially reduced in this first year of raised beds. Farmer Russel Thomson is confident the area will be reclaimed over the next few years (see the feature story on Russel Thomson's property in *SALT magazine*, Issue 7, available on-line at [www.ndsp.gov.au](http://www.ndsp.gov.au)).

Contact: Greg Hamilton, Ph: (08) 9368 3276 or  
 E-mail: [g.hamilton@agric.wa.gov.au](mailto:g.hamilton@agric.wa.gov.au)

# New breeding effort for salt-tolerant wheat

By Georgina Wilson

Creating salt-tolerant wheat by adding genes from a relative to canola is well underway in Western Australia with prospects for possible commercial release in about six years.

Grain Biotech Australia, a company supported by private investors, has been working on the project for two years.

Chief Executive Ian Edwards said that stacking of two new genes could provide salt tolerance by combined effects on osmo-regulation to exclude salt and storing of salt in vacuoles where it could do no damage.

He said that field trials of the new wheats were due to begin in June 2004.

Dr Edwards said that while most wheat died at about 50 millimoles of sodium chloride (500 millisiemens per metre) in soil water or a tenth of the salinity of sea water, implanting the new genes would allow survival at 200 millimoles sodium chloride or 40 per cent of sea water.

“Conservatively, I believe that in WA alone the new varieties could be grown on 1.2 million hectares of land that is now too saline for cultivation,” he said.

Scientists have been trying to breed salt-tolerant cereals for many years and in the 1970s work by Epstein on barley looked very promising but failed in the field – possibly due to a lack of waterlogging tolerance.

Other researchers at the University of Western Australia are currently working with sea barley grass and aim to produce a variety that is tolerant of both waterlogging and salinity.

Contact: Dr Ian Edwards, Ph: (08) 9360 7561 or  
E-mail: [iane@grainbiotech.com.au](mailto:iane@grainbiotech.com.au)

## Schools seek solutions

By Mark Warnick

Queensland schools have embraced the salinity challenge through a plant science competition.

The competition was run through the Department of Primary Industries' Hermitage Research Station at Warwick. Thirty schools entered the competition.

Students from Years One to Seven were asked to grow barley and chickpea plants in salt-affected soils and write a report on their observations and their implications on Australian agriculture. Older students were asked to submit a report on their research into a given case study about a farmer with a salinity problem. The entries were of a high standard and the students showed a lot of initiative in designing their projects and reports.

One hundred students from Warwick, Toowoomba and Brisbane attended the fourth annual Presentation Day at the Hermitage Research Station in November to collect their certificates and prizes from sponsors and QDPI staff.

According to competition organiser Mrs Kerrie Rubie, the competition, which started in 1997, aims to stimulate an interest in science and agriculture in young people.

## Native grasses conference call for papers closing soon

The 3<sup>rd</sup> Native Grasses Conference, sponsored by the Stipa Native Grasses Association and the Friends of Grasslands, will be held in Cooma, NSW, from 27–28 November 2003. People interested in grassy landscapes and the productive use of native grasses can submit their ideas for paper or poster presentations.

Speakers will be selected on the basis of their 'expression of interest' (abstract). Expressions of Interest must be received by 30 March 2003. Conference sub-themes will be determined following the receipt of abstracts — however, 'conservation of grassy landscapes' and 'role of native grasses in controlling salinity' are likely to be two key themes.

Poster-only abstracts can also be submitted. At least one of the authors must attend the conference.

Contact: Conference Co-ordinator Christine McRae  
E-mail: [cmcrae@hwy.com.au](mailto:cmcrae@hwy.com.au)

# Saltlist Diary



## Outlook 2003

4–5 March 2003, Canberra, ACT

National conference exploring the future of Australia's agriculture and natural resources.

Contact: [www.abareconomics.com](http://www.abareconomics.com)

## World Day for Water

22 March 2003

Water for the Future

Contact: [www.unesco.org/](http://www.unesco.org/)

## 2002 W.E. Wood Award

25 March 2003

Presentation of the National Dryland Salinity Program's 2002 W.E. Wood Award for Excellence in Salinity Research and Development.

Contact: [www.ndsp.gov.au](http://www.ndsp.gov.au)

## Native Grasses Conference

30 March 2003

Closing date for paper or poster ideas for the 3<sup>rd</sup> Native Grasses Conference (November 2003)

Contact: Christine McRae,

E-mail: [cmcrae@hwy.com.au](mailto:cmcrae@hwy.com.au)

## 'To drain or not to drain' forum

3 April 2003, Waite Campus, University of Adelaide, SA

South Australian Dryland Salinity Committee sponsored forum on drainage for salinity management.

Contact: Glenn Gale, Executive Officer, SADSC, Ph (08) 8303 9345 or

E-mail: [gale.glenn@saugov.gov.au](mailto:gale.glenn@saugov.gov.au)

## Ozwater Convention and Exhibition

6–10 April 2003, Perth, WA

Australian Water Association 20th Convention

Contact: [www.enviroaust.net/](http://www.enviroaust.net/)

## National Landcare Conference

28 April – 1 May 2003, Darwin, NT

Theme: Respecting Values — Working and Learning Together

Contact:

[www.landcareconference.nt.gov.au/](http://www.landcareconference.nt.gov.au/)

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## About Focus

*Focus* is published by Australia's National Dryland Salinity Program.

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Further information about NDSP can be found at the program's web-site, [www.ndsp.gov.au](http://www.ndsp.gov.au).

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RURAL INDUSTRIES RESEARCH & DEVELOPMENT CORPORATION



### National Land & Water Resources Audit

A program of the Natural Heritage Trust



MEAT & LIVESTOCK AUSTRALIA

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