



SAVANNA LINKS

Cooperative Research Centre for the Sustainable Development of Tropical Savannas

ISSUE 12
NOV-DEC 1999

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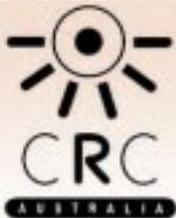
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ISSN 1327-788X



Established and supported under the Australian Government's Cooperative Research Centres Program

Savanna landscapes: defining health



Photo: CSIRO

The tropical savannas are managed by people with different viewpoints, who want to know if they are managing the land well. Yet how do we know if the savannas are healthy when "health" depends upon your point of view.

The Tropical Savannas CRC recently held two workshops to develop definitions of what we mean by "healthy" savanna country. We have done this because if we want to conserve and use the tropical savannas in the long term, then we need a way of measuring how sustainably we are managing the savannas now, and what changes may need to be made in the future.

In other words we need a way of measuring how "healthy" the country is, where "health" is a measure of those properties in the landscape that people value and want to maintain into the future. Thus a healthy savanna landscape might have viable populations of native plants and animals, sustainable pastoral activities or intact Aboriginal cultural values or a combination of all three depending on the scale considered.

Existing measures of landscape health

There are already several measures of the "health" of the savannas but they tend to focus on a particular set of properties valued by a particular group of people. For example, pastoralists have developed measures of pasture productivity and sustainability; parks managers have developed measures of biodiversity conservation; and Aboriginal communities have long-standing measures of the cultural values of the landscape.

But each measure on its own may not be a satisfactory way of gauging the health of whole

regions or catchments as these different values may conflict with each other.

The workshops, which involved a varied group of land managers, planners and researchers came up with a broad definition of savanna health as follows:

A healthy savanna

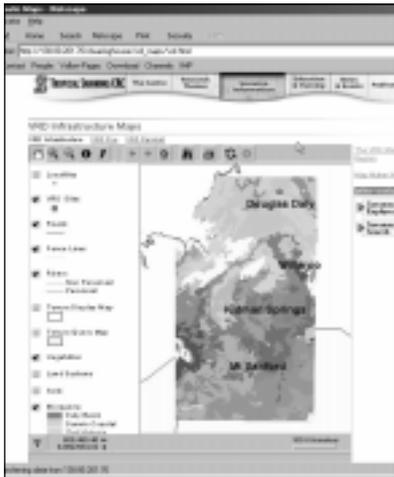
- Maintains basic functions at all spatial scales including:
 - nutrient cycling
 - water capture
 - provision of food and shelter for fauna
- Maintains viable populations of all native species of plants and animals at appropriate space and time scales; and
- Reliably meets the long-term needs (material, aesthetic and spiritual) of the people with an interest in the savannas over the long term.

Under this definition, a healthy landscape needs to have basic functions intact, such as the ability to effectively store nutrients like phosphorous and nitrogen and capture moisture so that it can support pastures, native vegetation, traditional foods etc.

Viable populations of all plants and animals

Continued on page 2

VRD Map Maker now online



The Tropical Savannas CRC website now features a Map Maker for the Victoria River District in the Northern Territory. The Map Maker is based on a Geographic Information System database.

What you can do with the Map Maker

→ Make a map. You can produce maps of vegetation, soils or land systems, together with information on these features such as vegetation community types, soil types, soil water holding capacity, nutrient status etc. These maps can be viewed at scales from the whole VRD down to a few square kilometres. These maps can be overlaid with property boundaries, river

courses, roads etc as desired. They can then be saved to disk and then printed out, used in a powerpoint presentation or emailed.

→ Check out fire histories. You can view fire scars patterns in the VRD for the years 1993-1998. Each fire scar can be queried for its date by clicking on it. You can also cross-check the fire scar patterns with vegetation and rainfall maps to look for patterns in burning.

→ Explore landscape relationships. What soils does mitchell grass occur on? What sort of soils are in the sandstone country? The relationship between soil types, vegetation and land systems can be checked by comparing different map layers.

→ Refer to background information on bioregions and the VRD which are accessible through links to other sections of our website.

→ Get assistance from a substantial help section that explains how to use the Map Maker.

To access the Map Maker go to the TS-CRC homepage <http://savanna.ntu.edu.au>, click on "Savanna Information" and then on "Savanna Map Maker".

Any feedback is much needed and welcomed.
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Search for fire information on the Web

A SEARCHABLE database of hundreds of research papers, reports, popular articles and proceedings on fire management in northern Australia is now available on the TS-CRC website.

Other sites allow you to search for literature in scientific journals, but much of the information on fire management across the savannas is in unpublished reports, conference and workshop proceedings.

For the first time the TS-CRC has tracked down these articles and put their details in a web-accessible database. Over 600 articles on fire management relevant to northern Australia have been collected. Details of all articles can be searched for by author, topic, keywords, title, region etc. Some articles have a summary attached.

*Similar searchable databases will be available shortly for weed management and sustainable grazing management.

To access Savanna Search go to the TS-CRC homepage <http://savanna.ntu.edu.au>, click on "Savanna Information" and then on "Savanna Search".

Savanna landscapes: how to define their health

Continued from page 1

native to that landscape are also necessary—perhaps not at the scale of paddock, but certainly at the scale of a catchment.

Over and above these biophysical characteristics a healthy landscape also needs to satisfy various human values such as the ability to graze cattle sustainably and the ability to support traditional Aboriginal practices.

How would this definition be used?

To use this definition, land managers and others need a set of indicators that would vary depending upon the scale considered. To measure health at the level of a paddock or a reserve only a few indicators might need to be considered: such as the coverage of perennial grasses or a measure of biodiversity. But at the level of a catchment a range of indicators would be needed to cover basic functions, biodiversity, pastoral and Aboriginal values.

The TS-CRC has already coordinated considerable research on a range of potentially useful indicators and

properties. A major task for the TS-CRC in the future is to refine an appropriate set of attributes or properties of the savannas that different user groups value—and a set of easy to measure indicators that tell us how we are managing these properties. The Centre has therefore sought the views of a wide range of people, with interests in savanna management, to describe the attributes of a healthy savanna and to identify ways in which those attributes can be measured.

In short, the aim of this exercise is to develop shared ideas about what features of the savannas are particularly important and need to be maintained over the long run, and to develop well-understood and widely-accepted methods for tracking how well we are doing.

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Ocean techniques to aid producers



The ocean is the key to forecasting long-term climate variability, according to CSIRO researchers. Improved seasonal climate forecasting will significantly benefit Australia's agricultural and production industries, they say. The agricultural community currently relies on climate predictions based largely on the Southern Oscillation Index (SOI).

According to CSIRO Tropical Agriculture's Dr Andrew Ash, the predictions are useful but have short lead times, modest reliability, and are not universally applicable across Australia.

"Improved forecasts targeted towards specific agricultural industries and regions are now possible." "These are based on a physical understanding of ocean processes, and include the influence on Australia's climate of sea surface temperatures (SST) from regions other than the equatorial Pacific."

Dr Ash's work, supported by the Land and Water Resources Research and Development Corporation's National Climate Variability Program, involves evaluating these new forecasting techniques that are based on ocean and atmospheric data, and matching them to industry needs.

The potential benefits to Australia's agricultural industries from this new-age forecasting technique are immense. Annual gains and losses associated with climate variability in agricultural production alone are estimated at around \$1bn. "Good long-term forecasts will significantly improve agricultural gains in good years, cut losses in bad years, and help land managers minimise environmental impacts," Dr Ash added.

CSIRO researchers are concentrating on applying better seasonal climate variability forecasts for the dryland cropping industries, the extensive grazing industries and the sugar industry.

"Tactical delays to planting times greatly improve expected yields in dry years while increasing fertiliser inputs can add considerable value in wet years to the dryland cropping industries. However, many of these decisions must be taken six to 12 months ahead which is at the limit of SOI-based prediction methods.

"Similarly, with the extensive grazing industries, managers of rangeland enterprises need to match animal numbers to a forage supply that varies enormously from year to year.

"We have shown that better management of this variable can produce a 24 per cent increase in economic returns as well as reducing the dependence of industry on drought support. Reliable seasonal forecasts nine to 12 months in advance would allow managers to make better economic decisions," says Dr Ash.

For more information:

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Agencies are also looking into the potential use of Global Positioning System (GPS) technology to be used to monitor climate change and climate forecasting. Queensland's Department of Primary Industries, University of Technology (QUT) and the Cooperative Research Centre for Satellite Systems have joined in a feasibility study of the technology.



Islands of green in a land of fire

WHY do Australian rainforests occur as islands within the vast tracts of eucalyptus? Why is fire a critical ecological factor in every Australian landscape? David Bowman examines these questions and others in his new book: *Australian Rainforests: Islands of Green in a Land of Fire*.

He demonstrates that fire is the most critical factor in controlling the distribution of rainforest throughout Australia. Furthermore, while Aboriginal people used fire skillfully, he concludes they did not significantly influence the evolution of Australia's unique flora and fauna.

Available from December 1999 and published by Cambridge University Press. Contact: David Bowman Tel: (08) 8946 7762 Email: david.bowman@ntu.edu.au

Book on north's fire management

The Tropical Savannas CRC together with the Bushfires Council of the NT and Meat and Livestock Australia, is to produce a book on fire management for north Australia in 2000.

The book aims to:

- collate and focus current knowledge on fire management in these landscapes;
- address fire management issues in the region, and raise awareness of these issues;
- describe best practice in fire management and promote change in practice;
- describe specific case studies;
- place fire management in a whole-of-landscape context;
- provide a gateway to fire information resources.

The book will be an extension publication rather than a reference book. It is aimed at fire managers of northern Australia and the people who work with them: pastoralists, Aboriginal land managers, park managers, land-care groups, rural fire service officers, tour operators, land management researchers and Aboriginal land management agency staff.

The book will be written by experienced north Australian fire managers and researchers and edited by Ian Partridge, a senior extension officer with Queensland Department of Primary Industry.

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Partridge pigeons are one of a large number of tropical seed-eating birds whose abundance and distribution have declined this century. *Fiona Fraser*, one of the TS-CRC's PhD students, has been studying the needs and habits of the bird to gain an understanding of why this may be so. Her work will also be used to help understand why other birds in the savannas are facing decline.



Photo: PWCNT

Fiona Fraser at the base of a radio-tracking tower listening for the location of a radio-tagged partridge pigeon

Fire, grazing and partridge pigeons

The partridge pigeon occurs in tropical woodland in the top quarter of the Northern Territory and is distinguished by bright red skin around the eyes. There is a geographically separate sub-species in the Kimberley, which is characterised by yellow skin around the eyes. Serious problems have emerged for these birds, as with all seed-eating birds in the savannas, despite European settlement occurring relatively recently compared to southern parts of Australia (Don Franklin *SL*, *Paradise falters for seed-eating birds*, Issue 6). As Don Franklin pointed out, a large number of these birds have problems proportionally more severe than for any other faunal group in the tropical savannas, and more severe than for seed-eating birds in other parts of Australia.

Clearly something significant is happening in the savannas that adversely affects animals that depend on seed and feed on the ground.

Speculation as to why many of these species may have declined includes changes in the savanna understorey vegetation brought about through grazing or altered fire regimes. Partridge pigeons nest on the ground, and increased nest predation may also have led to their decline.

In this research, the partridge pigeon is being used as a case study to explore the possible effects of grazing and altered fire regimes on some of the bird's basic ecological needs. These needs include availability of seed and particular habitats for nesting or roosting.

Feeding habits

Partridge pigeons feed upon the seeds of a vast array of annual grasses, perennial grasses, herbs and sedges in the savanna understorey. They consume a very diverse range of seed species (more than 60 seed species found in their diet so far), which easily exceeds the diversity of

seeds eaten by the gouldian finch, another, although more famous, declining granivore.

Despite this diverse intake of seeds, partridge pigeons possibly confront a food shortage shortly after the start of the wet season. Following the first big rains, much seed on or just under the soil surface germinates and so is no longer available for consumption. There are, however, some perennial grasses that set seed following these rains, and these could constitute a crucial food supply during this time.

Generally, one possible indication of a seasonal food shortage is that the foraging range for a species increases. To meet their daily food requirements, individuals have to forage further afield. Data collected from radio-tracked individuals in Kakadu and from a nearby grazed property indicate that partridge pigeons use two to four times as much area (during a one-week period) after the start of the wet season compared to the mid dry season. ↗



Partridge pigeons

- walk almost everywhere
- move in small loose groups, constantly cooing to each other
- are capable of short, rapid bursts of flight
- have a loud, rapid wing action: it's one of the noisiest pigeons in take-off
- they often walk to waterholes in large groups (maybe 30 in a single group) in the dry
- breed mostly in the early dry
- pull together a few strands of grass to make nests
- males and females share nesting duties
- both parents feed the young chicks on a special form of milk produced in the crop

Graduate courses overcome the distance

The TS-CRC and NTU's Master and Graduate Diploma of Tropical Environmental Management now features core units offered via the Internet, CD ROM and the post to cater for people in remote locations. The courses are designed for graduating students seeking training for employment with government land management and conservation agencies or private sector environmental consultancy firms, or for professional staff seeking to upgrade their qualifications.

The core units are:

- *Ecology and Management of Tropical Savannas* (Savanna structure and function and the relationship between ecology and management). Mode of delivery: external via CD-ROM, optional field trip. (Semester I)
- *Design and Analysis of Environmental Studies* (An introduction to the major types of investigations needed to address environmental problems). Mode of delivery: internal and external, paper based, plus audio tape and computer exercises. (Semester I)
- *Flora and Fauna Survey Techniques* (The design, conduct analysis and reporting of flora and fauna surveys). Mode of delivery: online with one-week field component in inter-semester break (July)*.

- *Tropical Wetland Management* (overview of wetland ecology, monitoring methods, sustainable use issues). Mode of delivery: on-line with one-week field component in inter-semester break (July)*.

- *Tropical Rangeland Management* (ecological, economic and social factors that influence the sustainable management of Australia's tropical rangelands). Mode of delivery: external mode, paper-based or on-line with field trip to VRD at start of Semester II.

- *Geographic Information Systems Applications in Environmental Management* (Practical application of spatial technology, particularly remote sensing and GIS) Mode of delivery: external mode, paper-based or on-line. (Semester II).

Students will also be required to complete undergraduate units for both the Master and Graduate Diploma courses. Short courses at James Cook University can also be taken as part of these qualifications.

* held in consecutive weeks

For more information and enrolment details

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Photo: Fiona Fraser

➔ Food shortages?

These results give preliminary support to the notion of an early wet-season food shortage. It is believed gouldian finches also have to deal with a seed shortage at this time of year and rely on locating patches of seeding perennial grasses. However, given the relatively sedentary disposition of partridge pigeons—the average weekly home range is 19 ha—they don't have the luxury of flying large distances in search of perennial grass patches as gouldians do.

Instead, they must increase their home range in the same general area they ordinarily inhabit. Except when water runs dry, partridge pigeons tend not to entirely leave their home range

in search of resources—possibly due to a general saturation of preferred habitat types in the region.

This suggests they may rely on a patchiness of resources in the understorey savanna at a much smaller spatial scale than do gouldian finches. Traditional Aboriginal burning practices may best maintain this sort of detailed spatial and temporal scaling of the understorey. In turn, this may suggest that the decline of this species could mirror the changing fire regimes associated with Aboriginal depopulation and non-indigenous land-management priorities.

Focus of research

This research is examining how fire regimes and grazing can affect understorey vegetation and seed availability at a relatively fine spatial scale. For example, wet season fires, given their small size and cooler burning temperature, can create a locally patchy understorey. They also tend to remove speargrass from the understorey and favour perennial grasses. Alternatively, a late dry-season fire can create a vast uniform understorey, which appears as an endless sward of speargrass. Speargrass seed,

however, is an important component of the partridge pigeon diet over the dry season, so possibly a combination of early dry-season and wet-season burning may best suit partridge pigeons.

Much more analysis is necessary before robust conclusions can be drawn about the range of influences on food availability and their significance. But by looking at species that use the savannas and their resources in different ways, we hope to identify common features that point to appropriate management. Developing an understanding of the ecological requirement of a species such as the partridge pigeon, and how to manage the savanna to satisfy their needs, is an important part of the larger picture of sustaining the tropical savannas.

📄 Websites:

Fiona Fraser's study: savanna.ntu.edu.au/education/students/current/fiona.html
TS-CRC research on granivorous birds: savanna.ntu.edu.au/research/projects/granbd.html

📖 Reading:

Franklin, D.C. (1999) Evidence of dissarray amongst granivorous bird assemblages in the savannas of northern Australia, a region of sparse human settlement, *Biological Conservation* 90; Pp53-68.

Study taps into future of water resources

As water use takes on increasing importance for agriculture and urban use, a TS-CRC study has broken new ground in understanding water uptake by trees, and developed new methods to measure water usage in the tropics.

By Lindsay Hutley, Derek Eamus and Anthony O'Grady

Water resource use is increasingly becoming a major environmental issue in Australia. This is largely because our agricultural systems have traditionally used European-based models of water resource use—that rely on more predictable rainfall, and a more even seasonal distribution of rain than can ever be the case in Australia. Our highly variable climate and rainfall patterns mean that sustainable use of water resources is critical.

To sustain our water resources into the future, we need adequate flows of water to the environment to maintain landscape health as well as providing for agricultural and domestic needs.

However, this is easier said than done given a generally poor understanding of the role that groundwater plays in most Australian environments, and how that environment might change following the development of a water resource (Hatton and Evans, 1998). Irrigated agriculture accounts for more than 70 per cent of Australia's water use and an increasing amount will be sourced from groundwater reserves, especially in the Northern Territory.

In 1993 a research project was initiated by the NT Department of Lands Planning and Environment (NTDLPE), CSIRO and Northern Territory University (NTU) to assess the impact of water resource developments on the tropical savannas. In 1996, with the inception of the TS-CRC, the project became *Water and Carbon Exchange of Savannas*, and was intensified to investigate groundwater use in the Darwin rural region. In 1997 the Land & Water Resources Research & Development Corporation (LWRRDC) also helped fund the project.

Key questions

One of the project's tasks was to develop scientific

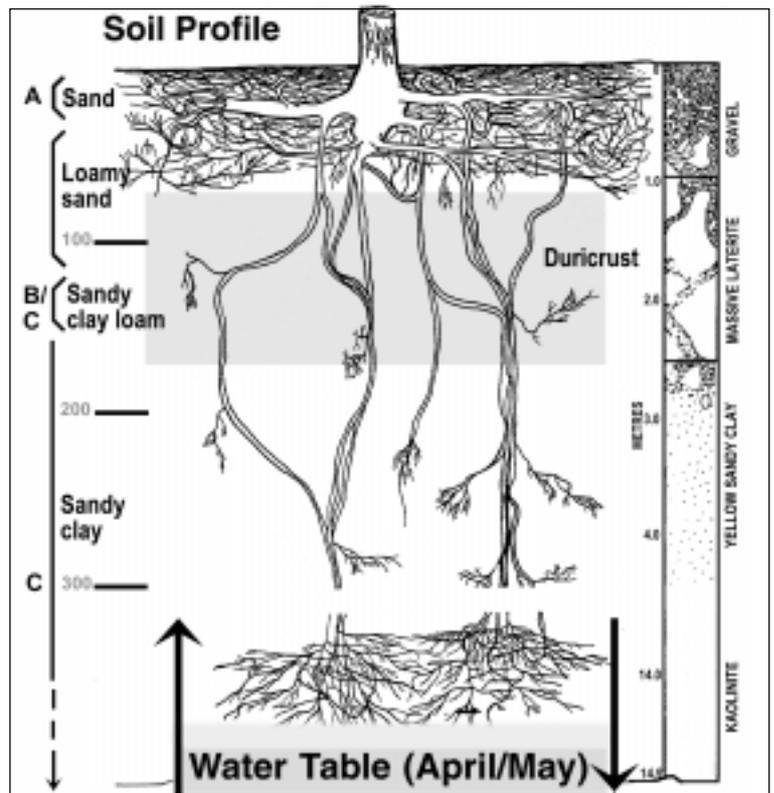


Figure 1: Hypothetical root distribution for a mature Eucalypt tree growing in the Darwin region. Figure modified from that of Kimber (1974) *The root systems of Jarrah. Forests Department of Western Australia, Research Report No. 10, 5 pp.*

methods to determine such requirements. The TS-CRC has links to many different agencies enabling it to bring together researchers with expertise in a range of areas.

Once water has entered the soil-groundwater system, the single largest route for water loss is through use by vegetation. This loss is known as evapotranspiration. Therefore we need to quantify daily and seasonal patterns of water use by this vegetation and in particular by the dominant eucalypt savanna. What are the relative contributions of the soil, understorey and trees to catchment evapotranspiration in the wet and dry seasons? Does the dry season (when the upper soil dries) significantly reduce tree water use?

Tree water use

For more than three years, NTU PhD student Anthony O'Grady has been measuring patterns of tree water use of the dominant eucalypt species at the Howard River catchment, near Darwin. He has discovered that while the hydrology of the Top End is highly seasonal, this is *not* the case for tree water use. Tony found that although trees have fewer leaves during the dry season, compared to the wet, each leaf uses more water in the dry. This results in a constant rate of water use all year round, with trees transpiring the equivalent of approximately 0.9 mm of water per day. Indeed, eucalypt water use is readily predictable, given simple estimates of their size and girth.

This result raises a key question: how much of this

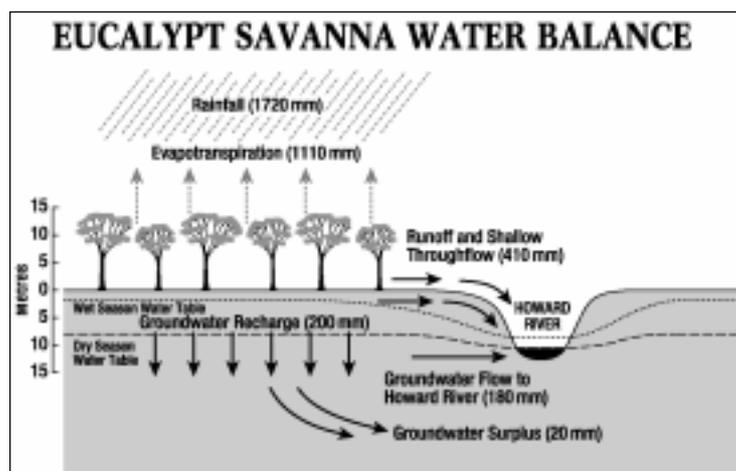


Figure 2: Hydrological cycle and water balance of Top End tropical eucalypt savanna

water is groundwater? If the rate of dry-season water use is equivalent to the wet-season rate because trees access the water table, then trees are relying on groundwater. Over-exploitation of groundwater could then result in long term water shortages for trees in the dry season.

Trees and groundwater

This question of water sources for trees is not easy to answer. During the wet season, rainfall becomes surface run-off or enters the soil. Given the high rainfall of the Top End, the soil's capacity to soak up water is soon exceeded and water drains from the soil recharging shallow groundwater aquifers or flowing through into streams. During the dry season therefore, trees could be using soil water exclusively, or groundwater, or a mixture of both.

Excavations of root systems have revealed a concentration of roots in the top 1-1.5 m of soil (Figure 1). For large trees, roots can occur up to 10 m deep: about the depth of the water table at the end of the dry season. Thus a tree can exploit a large volume of soil—and that soil can store up to 400 mm of water, which is in excess of the amount used by trees in the dry season. Trees could therefore be sustained from soil reserves alone.

Further, large and small trees are able to flush their canopies with new leaves during September and October, periods when upper soil moisture levels (top 2 m) are at a minimum and the water table is around 10 m below the surface. This leaf growth requires a considerable amount of water and

small trees do not have deep root systems. This suggests they have adequate access to water from the soil alone.

Whole ecosystem water use

Trees are only a part of the savanna community, and the understorey, dominated by tropical grasses such as *Sorghum*, are also significant. Whole canopy water use—the understorey, small trees and mature trees—was measured at Howard Springs in conjunction with the tree studies from 1996 to 1998. Unlike measures of individual trees, when the whole ecosystem is considered a much stronger seasonal pattern emerges.

Measurements suggest that the grass-dominated understorey is responsible for about 75 per cent of total ecosystem water loss, and this occurs almost entirely in the wet as there is very little grass in the dry.

Since grass-water usage is confined to the wet it would definitely not involve groundwater. However, grass-water use will affect the amount of water stored in the soil and hence the rate of groundwater recharge.

Understanding the way in which trees and grasses behave will help predict consequences of clearing savanna patches for agriculture and horticulture as is rapidly occurring in Darwin's rural region.

Surplus groundwater?

As part of the TS-CRC project, CSIRO scientists Drs Tom Hatton and Peter Cook constructed a water balance for the research catchment (Figure 2). Using changes to aquifer CFC con-

centrations with depth below ground, the rate of recharge was estimated to be 200 mm year⁻¹. This includes a 20 mm 'groundwater surplus'. An error analysis suggests that this surplus may be as small as zero, or as large as 140mm. If we assume it is about 20 mm for a catchment such as the Howard River, this represents a sustainable yield of at least 2500 ML of water per year.

While we currently think groundwater extraction is unlikely to threaten the eucalypt savanna, other ecosystems may be vulnerable, such as spring-fed monsoon vine forests.

Impact of variable seasons

Another factor to consider is that our conceptual model (Figure 2) is based on mean flows only and does not take into account year-to-year variability. The study's measurements of tree and canopy water use were conducted during three of the wettest seasons on record. What would happen if we have three poor wet seasons in a row? The only way to answer such questions is to attempt to model vegetation water use, in combination with soil water and groundwater dynamics.

Scenarios can then be tested where simulated water stress (e.g. below-average rainfall plus a pumping regime) is imposed and we can examine the way the system behaves. In this way we are able to combine functional understanding of the interactions between climate, vegetation, soil and groundwater to enable sustainable water resource use.

Hatton, T.J. & Evans, R. (1998) *Dependence of Ecosystems on Groundwater and its Significance to Australia*. Land and Water Resources Research & Development Corporation Occasional Paper No 12/98.

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Water and Carbon Exchange of Savannas
savanna.ntu.edu.au/research/projects/carbon.html
TS-PhD students involved in this project:
• Georgina Kelley • Jodie Pritchard • Chen Xiaoyong (NTU)
Go to savanna.ntu.edu.au/education/students/current.html



This issue SL interviews two environmental managers: Peter Wellings, Assistant Secretary, Parks Australia North and Mark Ritchie, Property Planning & Environmental Officer, North Australian Pastoral Company (NAP). Both oversee extensive areas of land, one working with indigenous Australians and the other with pastoral managers.

Joint management seeks balance in national parks

In September, Peter Wellings took over reigns of both Kakadu and Uluru as well as the environmental management of Christmas Island. His viewpoint is fashioned by both ecological imperatives and the concerns of Aboriginal traditional owners. *Interview: Dennis Schulz*



Peter Wellings

Photo: Dennis Schulz

PW: There was a great T-shirt Aboriginal kids used to wear at Uluru National Park. It had “Not Passing Through” written on it. That’s an idea that always stuck with me. They are not leaving. They’ve got to live with long-term consequences when a particular decision’s made, whereas key decision-makers are often people who are just passing through; like bureaucrats, tour operators and some pastoralists.

SL: Is that idea something you keep in mind when a decision is to be made?

PW: Yes. If you are a park manager who’s only there for two or three years, more often than not you’re gone before the consequences of your actions become really apparent. Whereas the traditional owners of a park like Kakadu are there permanently.

Sometimes you hear this idea that you don’t have to worry about managing the country because the country will look after itself. I’ve always rejected that idea because we’ve always got to realise that land management is a big part of our core business.

We have a system of joint management in Uluru and Kakadu. But different value systems are always at work. While we initiate intense feral animal control regimes, traditional owners still want to talk to us about the potential of having some buffalo back in the park. Pigs are an even more contentious issue. There are differences of opinion. But again, if Parks’ staff just tell the Aboriginal mob, “this is a national park and you just have to accept our way of doing things”, that’s not joint management.

The land always provided for Aboriginal people’s needs, and that’s not changed. If they are looking to develop some kind of economic base from their country, they just have to look to the resources there to do it with. That’s why people might hold off shooting the buffalo or the pigs, because at the end of the day, that’s a resource—one of the few resources they have.

When I first went to Kakadu everybody seemed to agree that there were too many buffalo and they had a

significant impact on the country and that numbers should be reduced. Then (after shooting) came the point when the traditional owners said “we think the net benefit of having the buffalo matches the cost of having the buffalo, and it’s an acceptable balance”. Whereas a whitefella’s thinking is you only reach an acceptable balance when there are no buffalo.

SL: Do you think they are happy with joint management arrangements?

PW: Traditional owners are seriously rethinking about how they benefit from joint management. We’ve assumed they were happy with the deal and that some Aboriginal people were enjoying the benefits of full-time employment with the Park. But things like the Kakadu Region Social Impact Study (a report highlighting Aboriginal disadvantage in the area) shows most people are not benefiting from regional development.

It’s about control. They see themselves as the passive recipients of what happens rather than really managing their lands. They see that Kakadu has become an engine room for the regional economy that goes beyond the park. A substantial amount of growth in Darwin is in tourism that involves visits to Kakadu National Park. They’ve seen people like me come to Kakadu as a young fella, and they see themselves marking time while I’m moving on, receiving rewards. There are others who don’t believe their health and living conditions have improved that greatly over the past 20 years.

SL: So, in the future, how do you, as a park administrator, accommodate that enormous cultural gulf?

PW: We have to concentrate on our shared interests. We all believe that healthy ecosystems are productive ecosystems. And the land has always provided for them and has to continue to sustain them. They need to be deriving income and economic support from their land, through tourism or in other ways. Another good one is sustainable use of wildlife: the extent to which you harvest naturally occurring populations of wildlife without



Strategies aim for right mix in sustainable land management

In his job as Property Planning & Environmental Officer, NAP, Mark Ritchie visits 11 cattle stations covering about 60,000 square kilometres, or 14 million acres of north Australia. The area he covers extends from Barkly down through Diamantina channel country to Cloncurry and Winton. *Interview: Peter Jacklyn*

SL: What do you do?

MR: My overriding position is to write management plans for all of our stations. It's complete documentation of all our property resources. Land resource mapping plays a big part in determining what we actually have as far as natural resource go, this then allows us to set a number of management objectives at a paddock level and at a broader property level. Putting in place a number of strategies that deal with woody weed management, pasture and grazing management, soil conservation, cultural heritage, climate variability and biodiversity. We have a fairly pragmatic and flexible approach to these areas as the environment will dictate what will happen. Things like pasture quality and woody weeds are monitored annually. But wildlife ecology issues such as kangaroos and bilbies are monitored less frequently.

SL: Is that an important part of your job going around monitoring properties and their condition?

MR: Certainly is, it is definitely something we are trying to get our managers more involved in. The managers within the group are very good but I get involved in the more technical aspects of pastures. With my expertise and providing background information we work together in implementing our objectives. We generally do monitoring together and information from this is used to make some important decisions—particularly on stocking rates. We usually monitor after the wet to get a better

feel for pasture growth in particular areas and look at what particular paddocks might carry through the dry until it rains again.

SL: Do you also monitor things like wildlife?

MR: Certainly flora and fauna conservation is covered in our Management Plans. We've identified areas that have important conservation values including mound springs, wetlands and endangered species within our grasslands. We are in the process of compiling species lists for our birds and animals so we can implement some management objectives for important species. Also, we are trying to take a holistic view of the property then progress that right back through the organization in terms of QA and accreditation.

SL: From your monitoring of pasture condition, wildlife, etc., what's your impression on how your stations are travelling? Can you make any general comments?

MR: We have certainly seen some increases in pasture condition, or range condition, for the time that I have been there (six years). You have to remember that six years is a relatively short time to see any major changes in our environment.

SL: What about the wildlife side?

MR: Determining changes within fauna species is a bit more difficult. No, we haven't seen any real decline, especially not in our bilby populations. We only monitor them intermittently but it's pretty hard to get a relationship with bilbies because they

are nocturnal. I can monitor bilby holes as active or inactive but as to how a bilby relates to its hole is still a bit of a trick. One animal may use 3–4 holes in a night.

SL: You must need a lot of information.

MR: Certainly. We use government agencies extensively and we have a degree of information sharing between the pastoral companies that we find useful. We are all tackling the same issues at the same time. However, much of the information we need and use we derive ourselves. I spend time in libraries and on the Internet and networking and talking to other people.

SL: Is there enough information out there for your needs?

MR: There's never enough information. There's lots of information about specific issues, but it's mostly in a scientific format. It's drawing the principles out of the science and putting it into a practical sense and being able to apply it.

SL: What kind of information do you need more of?

MR: Land resource information is lacking in some places: information on land systems and productive capabilities of individual land systems. I find a lot of the land resource information I need to use is out of date. Much of the land resource information we need we are putting together ourselves. In south west Queensland, the Western Arid Region Land-Use Study was done by DPI in the 1970s and 1980s. That provides quite accurate land systems data. But in the Gulf Country, there is only the Gilbert Leichhardt study, conducted in 1949. In the Barkly Tablelands, there is a 1948 CSIRO study. Times change and people are managing their lands a lot more critically. That broader landscape scale information is not really there; at least not accurately.

→ impacting on the long term viability of the populations. Things like this sustain them on their land.

It gets down to the issue of balance. And there's a big role for science here. Making a well-informed decision about where that balance should lie really depends on the quality of information you have at hand.

There are impacts that aren't evident to the eye that might only be brought to your attention through scientific

research. For example, say you researched what pigs ate and found that they impacted heavily on a wildlife population that's culturally important to the traditional owners. That may tip the balance on a feral control decision.

That's one of the bottom lines for me with joint management: that there is true sharing of decision making and sharing in the consequences of those decisions.

Desert Uplands online

THE Desert Uplands Community Scheme now has its own website. The community-based scheme is a voluntary coalition of landholders, members of the community and government representations concerned about land degradation and declining standards of living in the region. The site contains information on the scheme and its projects, publications, news and events in the region, maps and tourism information. www.sunzine.net/outback/desertuplands/

CD for beetles' fans

BEETLE fans around the world will have interactive access to thousands of the world's beetles through a new CD ROM. *Beetles of the World* is the product of the world's largest database of its kind, built using DELTA (DEscription Language for TAXonomy) software designed by CSIRO. It is the first comprehensive interactive system for identifying all families, most subfamilies and selected tribes and genera of beetles from any part of the world. It has anatomical, distribution and ecological information for each group, as well as images of representative species and lists of published references. The database comprises 945 groups, family, subfamily, tribe or genus. The CD contains more than 3300 illustrations of all groups of beetles.

Dr John Lawrence Tel (02) 6246 4268
Dr Ebbe Nielsen Tel: (02) 6246 4258

How they beat the drought

A BOOK that brings together real-life experiences of drought in Queensland's Burnett region features nine case studies of primary producers'. It details their management practices enabling them to survive the prolonged drought throughout much of this decade. Published by Qld Dept. Primary Industries, *Successful Strategies for Managing Hard Times—Experiences for the Burnett*, recounts successful strategies to survive variable climatic and economic conditions, tells of innovative and alternative options that have worked and shows the advantages of working to a plan. The DPI's senior stock inspector in Kingaroy, Phil Day, led the project team involved in the book's compilation.

Boost for knowledge of life on earth

A ONE-stop international facility for information on biodiversity will be launched next year. The Global Biodiversity Information Facility (GBIF) will link existing databases on biodiversity with new databases into a single global information resource. The growth of the world's great collections has outpaced the ability to handle and use the data inherent in them. Today there are approximately 3 billion specimens held by the biological collections of the world. The GBIF will include existing databases on the distribution of plants, animals and microbes around the globe, detailed genomic maps, compilations of the physiological functions of organisms, and information about the behaviour and function of species within ecosystems. The in-principle agreement to establish the facility was announced by the Organisation for Economic Cooperation and Development (OECD) Science Ministers.

Call: Mr Malcolm Robertson Tel: (02) 6246 404
or Dr Ebbe Nielsen Tel: (02) 6246 4258

The book may be ordered through the DPI Call Centre by phoning 132523.

Nominations for bush Logies

QUEENSLAND'S Logies of the Bush are back, showcasing the innovation and talent of the people involved in the State's production, agricultural, fishing and forestry industries. The awards are a highlight of the state's Primary Industries Week 2000—held across the State from March 12-18 2000. The awards will acknowledge the commitment and talent of people involved in the development and promotion of primary industries. Nominations are sought from primary producers, individuals, groups and organisations across the State. Winners will be announced at an awards night ceremony at Parliament House on Friday, March 17, 2000. Nominations close on February 11, 2000.

Contact Primary Industries Week coordinator, Liz Smith, on (07) 3239 3725, Email: smithl@dpi.qld.gov.au

Fire in the Australian landscape

A RECOURCE book for senior school students in environmental studies, biology and geography takes an historical journey to explore the role fire has played in shaping the Australian landscape—from pre-human times through to Aboriginal and European history of fire use. The book examines the chemical and physical background to fire and its characteristics; ecological responses

flora and fauna to fire and investigates the use of fire in areas of land management.

NRE Information Centre
Tel: (03) 9637 Fax: (03) 9637 8150
Email orders to
inforcentre@nre.vic.gov.au

Farmers' guide to Internet

AUSTRALIAN farmers and producers now have a new tool in their search for more efficient communications, with the launch of *The Australian Farmers Guide to the Internet*. This is the second edition from the Rural Industries Research and Development Corporation and Farmwide Pty Ltd which explores cyberspace looking at what is available, assessing sites and answering many questions about new era communications. Household usage of the Internet in regional Australia has doubled in the past year to 16 per cent, but is still 10 per cent lower than city families. The book looks at electronic mail, the WWW, newsgroups, chat rooms and even how to develop a personal website. It includes reviews more than 500 web sites, which are updated on a regular basis through the website that accompanies the guide. These sites are of particular interest to agriculture and cover commodity prices, production information, government services, banking, and commercial services.

Available from RIRDC
426 pages: \$30 and \$8 postage
Call (02) 6272 4819

Ecology & Environment**ISEE 2000 People and Nature: Operationalising Ecological Economics****5–8 July 2000****Venue:** Australian National University, Canberra.

ISEE 2000 will focus on operational applications and achievements of ecological economics. The conference is integrated around major conceptual challenges and practical problems.

Contact: Beth Stoodley**Tel:** (02) 6249 3806 **Fax:** (02) 6279 8066**Email:** beth.stoodley@anu.edu.au**Postal Address:** Centre for Continuing Education

Australian National University Canberra ACT 0200

Website: www.anu.edu.au/cce/isee/**International Landcare 2000****Changing Landscapes, Shaping Futures****2–5 March 2000, Melbourne****Venue:** Melbourne Convention Centre.

The conference will explore issues such as sustainable agriculture and communities, biodiversity and greenhouse.

Contact: Waldron Smith Convention Network**Postal Address:** 93 Victoria Avenue Albert Park, Victoria, Australia 3206**Tel:** (03) 9690 6744 **Fax:** (03) 9690 7155**Email:** wscn@bigpond.com**Website:** www.nre.vic.gov.au/conf/landcare2000/**International Symposium of advances in carbon and nutrient cycling and catchment processes in managed forests 21–25 August 2000, Gold Coast****Contact:** Tim Blumfield**Tel:** (07) 3875 7494**ISEE 2000 People and Nature: Operationalising Ecological Economics****5–8 July 2000****Venue:** Australian National University, Canberra, Australia

ISEE 2000 will focus on operational applications and achievements of ecological economics. The conference is integrated around major

conceptual challenges and practical problems. The conference is being organised by the International Society for Ecological Economics and the Australia New Zealand Society for Ecological Economics.

Contact: Beth Stoodley**Tel:** (02) 6249 3806 **Fax:** (02) 6279 8066**Email:** beth.stoodley@anu.edu.au**Postal Address:** Centre for Continuing Education

Australian National University Canberra ACT 0200. Registration forms available on the website

Website: www.anu.edu.au/cce/isee/**Pastoral Interests****Primary Industries Week 2000 March 12–18 2000, Queensland**

Primary Industries Week aims to increase the community's understanding and awareness of the State's primary industries and their importance to the economy.

Contact: Liz Smith

Primary Industries Week coordinator

Tel: (07) 3239 3725,**Email:** smithl@dpi.qld.gov.au**Website:** www.dpi.qld.gov.au/piw2000**Beef Expo 2000****9–16 April 2000, Central Qld****Venue:** To be announced.

The event will highlight contributions made by the national beef industry to the Australian society. It will focus on opportunities which will allow the beef industry to build a dynamic, secure future into the next millennium. It is organised by the Australian Beef Cattle Exposition Association Inc.

Website:

leaky.rock.tap.csiro.au/Beef2000/beef2000-structure.html

Tropical Grassland Society Conference—Pastures for Production and Protection 26–28 April 2000, Emerald**Venue:** Emerald Agricultural College

The conference focuses on protecting soil, building fertility, controlling weeds. It also features field trips to inspect legumes and native grass pastures. Sessions include mine revegetation systems, pasture and cropping systems, native pastures and weed eradication.

Contact: Maurice Conway TGS**Tel:** (07) 4982 8814 **Fax:** (07) 4982 3459**Email:** conwaym@dpi.qld.gov.au

www.powerup.com.au/~tgsoast

To submit posters contact:

Karen Healey, University of Queensland, Gatton College

Tel: (07) 5460 1307 **Fax:** (07) 5460 1112**Email:** k.healey@mailbox.uq.edu.au**Mining****4th Australian Workshop on Acid Mine Drainage 28 February–3 March 2000, Townsville**

The Australian Centre for Mining Environmental Research (formerly ACMRR) conducts courses and workshops on issues relating to environmental management for the mining and quarry industries.

Contact: Zania Clark

Communications Officer

Australian Centre for Mining Environmental Research

PO Box 883 Kenmore 4069 Qld

Tel: (07) 3212 4655 **Fax:** (07) 3212 4574**Email:** acmer@mailbox.uq.edu.au**Website:**

http://www.acmer.com.au/training/AMD%20Workshop%20(htm).htm

General**National Science Week 3–10 May Australia-wide****Contact:** Ms Willow McGregorNational Coordinator, , Level 5, Health Building, Corner of Moore and Alinga Streets, Canberra ACT 2601
Email: scienceweek@orac.net.au or
Tel: (02) 6205 0281**Cooperative Research Centre Association Conference 17–19 May 2000, Brisbane**

The Cooperative Research Centre Association Conference has three objectives:

- Promotion of the CRC Program through CRC achievements
- Involvement of key stakeholders/decision-makers
- Self-help for CRC's.

Submissions are invited to participate in Awards for Excellence in research use; Showcasing CRCs and the CRC Program; Displays. Deadline for submissions is COB, Friday, 18 February, 2000.

Contact: Dr Michael Hood
Organising Committee
CRCA Conference Planning
Committee Chairman
CRC Mining Technology & Transfer
Tel: (07) 3212 4520 Fax: (07) 3212 4683
Email: l.mete@cat.csiro.au

**Desert Uplands Festival
3–19 May, 2002**

The Desert Uplands Festival is an ambitious project which aims to celebrate and affirm the culture and lifestyle of the region. The regional festival will include the towns of Alpha, Jericho, Barcaldine and Aramac. If you would like to contribute to the planning process, contact the Desert Uplands Committee.

Contact: The Desert Uplands Office
Tel: 1800 007 807 **Fax:** (07) 4651 11001
Email: DESERT.UPLANDS@bigpond.com
Website: <http://www.sunzine.net/outback/desertuplands>

Water Management

**Hydro 2000 3rd International Hydrology and Water Resources Symposium
20–23 November 2000, Perth**

Venue: Sheraton Hotel, Perth
The symposium will commence with optional workshops on Monday 20 November 2000. The main symposium runs from Tuesday 21 to Thursday 23 November 2000, inclusive. An optional two-day tour on Friday 24 and Saturday 25 November completes the week of information exchange. Sub-themes include: interactions between hydrology and the environment, society, climate, surface water and groundwater; infrastructure industry; the built environment and interactive hydrology.
Contact: Congress West Pty Ltd
Postal Address: PO Box 1248
West Perth WA 6872
Tel: (08) 9322 6906 **Fax:** (08) 9322 1734
Email: conwes@congresswest.com.au
Website: www.ieaust.org.au/hydro2000/

Weed Management

**Weed Science Society of America
5–10 February 2000, Lawrence, US**

Venue: Westin Harbour Hotel, Toronto, Canada
Contact: J. Breithaupt
Postal Address: PO Box 1897
Lawrence, KS 66044, US
Tel: 1 913 843 1235 **Fax:** 1 913 843 1274
Email: jbreith@allenpress.com

**III International Weed Science Congress
June 6-11 2000, Curitiba, Paraná, Brazil**

Venue: Foz do Iguassu, Brazil
Contact: PJ Eventos
Fieras e Congressos
Postal Address: Rua José Risseto, 1023
Curitiba, Paraná Brazil CEO 82.015010
Tel/Fax: 55 41 372 1177
Email: pj@datasoft.com.b

Visit our website to view an extensive calendar section: savanna.ntu.edu.au/news/calendar.html or just go to our home page and click on the blue heeler.

The Tropical Savannas CRC is a joint venture of the major organisations involved in land management of the savannas of north Australia. It comprises three universities, three divisions of CSIRO, four NT government agencies, three Queensland government agencies, two WA government agencies and one federal agency. The Centre promotes the sustainable conservation and use of Australia's tropical savannas. It does this by acting as a bridge between agencies engaged in land management research and the various industries representing land users - e.g. pastoralists, Aboriginal groups, the tourist industry and conservation managers; and by looking for ways to ensure more research ends up being used on the land.

Savanna Links is edited and produced by the Tropical Savannas CRC.

Unless otherwise stated, all articles are by Peter Jacklyn and Kate O'Donnell. Layout Kate O'Donnell.

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Views expressed in **Savanna Links** are not necessarily those of the Tropical Savannas CRC.

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