



SAVANNA LINKS

Cooperative Research Centre for Tropical Savannas Management

Issue 33
2006

ISSN: 1327-788X
<savanna.cdu.edu.au>

See our products brochure with this issue of *Savanna Links* for our latest publications and websites including the new Savanna Explorer and Land Manager websites:

<www.savanna.org.au>
<www.landmanager.org.au>

Sustainable and profitable grazing

An eight-year research project has taken a big-picture look at rainfall variability and grazing management—and the results show that sustainability and profitability go hand-in-hand. See pp. 6–10.



CONTENTS

NEWS 2–5

- Arnhem fire agreement
- CRC cut short
- NAILSMA online
- CEO leaves
- NRM plans
- Urban myths & DVD

GRAZING 6–10

- Big picture of Wambiana

SEA COUNTRY 11

- Art from drift nets
- Dugong and turtles

CYCLONES 12–14

- Savanna patterns
- Resilient trees
- Cyclone Larry research
- Missing flying foxes

INDIGENOUS 15–16

- Violet Valley & Bow River

SAVANNA BITES 17

BIODIVERSITY 18–20

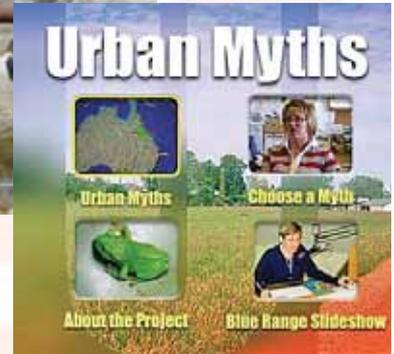
- Fairy-wrens in the VRD

WEEDS 21

- Weeds Conference

BOOKS & WEB 22–23

CALENDAR 24



Urban and rural myths

NEW research that identifies urban concerns about rural land management could help to bridge the urban–rural divide.— See p. 5.

Landmark fire agreement

A new agreement for west Arnhem Land is set to boost fire management in the Top End, reduce greenhouse gas emissions as well as provide meaningful jobs and benefits for people on country— p. 2.



Where are the flying foxes?

Up to 200,000 flying foxes are still missing after Cyclone Larry—and they may be in the savannas—p. 14.

Cyclones gives clues to savanna patterns

Devastating as this year's cyclones were, the storms are providing an opportunity to learn more about how cyclones affect the dynamics of the savannas.

See pp 12–14.

Photos this page, clockwise from top: Kate O'Donnell, QDPI&F, Garry Cook, CSIRO, NT Government.



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

Fire agreement to strengthen communities

A LANDMARK agreement between Indigenous land managers, government and the energy industry, is set to boost fire management in the Top End, reduce greenhouse gas emissions as well as provide meaningful jobs for people on country and benefits to the communities involved.

The West Arnhem Fire Management Agreement (WAFMA) project is a partnership between the Northern Territory Government, Darwin Liquefied Natural Gas, the Northern Land Council and Traditional Owners from coastal Maningrida, to the headwaters of the Katherine and Mann rivers, as a strategy for offsetting greenhouse gas emissions from the Wickham Point Gas Plant.

“This is an historic agreement—a first of its kind for the world—that brings together the world’s oldest cultures with Western science,” the NT’s Environment Minister, Marion Scrymgour said. “It is also the first time that a major energy company has formed a partnership with Aboriginal Traditional Owners to foster a return to traditional fire management regimes leading to a subsequent reduction in greenhouse gases.”

As part of the arrangement, Darwin Liquefied Natural Gas will provide around \$1 million every year for the next 17 years to Aboriginal Traditional Owners of western Arnhem Land to implement a fire burning strategy. Patchy burns will be implemented across the landscape to better protect the Arnhem Land Plateau from the wildfires that occur late in the year. The burns will break up the fuel available for destructive fires. Limiting wildfires will in turn reduce the emission of greenhouse gases from that landscape. Savanna fires are the greatest source of greenhouse gas emissions for the Northern Territory. Based on estimates for 2004, burning of savannas contributes 41% of the NT’s accountable emissions.

Patchy grass fires, however, emit fewer greenhouse gases than wildfires which can kill trees. If a mosaic of patch burns limits the spread of wildfires, less of the landscape is burned and fewer greenhouse gases emitted. Reducing emissions in this way from the west Arnhem Plateau will offset greenhouse gas emissions from the Liquefied Natural Gas plant at Wickham Point.

Research coordinated by the TS-CRC and involving CSIRO, Bushfires NT, the Australian Greenhouse Office, NT’s Department of Natural Resources Environment and the Arts, and Western Australia’s Department of Land Information



Members of the Arnhem community, including Lofty Bardayal Nadjamerrek, with Environment Minister Marion Scrymgour and researchers Jeremy Russell Smith and Peter Cooke

underpinned the feasibility of the agreement.

“The Tropical Savannas CRC will be contracted to monitor and report on greenhouse gas emissions during the agreement,” said Dr Jeremy Russell-Smith, fire ecologist with the Bushfires NT and TS-CRC.

A major outcome is that the agreement will provide meaningful jobs for people in the long term, with a host of benefits to the communities involved, said Jeremy. These include:

- providing role models and better career paths for Aboriginal children—a focus of the project.
- supporting transfer of Indigenous knowledge between generations as elders work with young people.
- helping people re-establish contact with traditional lands.
- building English skills and cross-cultural confidence essential to economic activities such as tourist enterprises.
- supporting partnerships between remote communities leading to improved social and economic coordination.

Limiting wildfires will also help conserve environmental and cultural values of the Plateau. These include numerous rock art sites and around 77,000 ha of rainforest which are being damaged by repeated wildfires.

Contact Dr Jeremy Russell-Smith, Bushfires NT Tel: (08) 8922 0830 Fax: (08) 8922 0833 Email: <jeremy.russell-smith@nt.gov.au>

Tropical Savannas CRC: Linking the North

The Tropical Savannas CRC is a joint venture of the major organisations involved in land management of the savannas of northern Australia.

It comprises three universities, government agencies from the NT, Qld and WA and the Commonwealth, CSIRO, and representatives from Aboriginal groups and the pastoral industry.

The Centre promotes sustainable use and conservation of Australia’s tropical savannas by acting as a bridge between agencies engaged in land and resource management research, and research users and decision makers. These include pastoralists, conservation managers, Aboriginal land managers, and the tourism and mining industries.

The Centre communicates outcomes of its research and other knowledge about the savannas to ensure this knowledge can be used effectively by people living and working in Australia’s savannas.

Acting CEO: Dr David Garnett
Tel: (08) 8946 6834 Fax: (08) 8946 7107 Email: <savanna@cdu.edu.au>
Web: <savanna.cdu.edu.au>

Future cut short for CRC

THE Tropical Savannas Cooperative Research Centre submitted a business case to the CRC Secretariat for a new CRC for Tropical Savannas Futures, but despite making it to a short list of 20 proposals, our case was not successful. The new CRC aimed to create opportunities for Natural Resource Management and environmental service-based industries and enterprises across northern Australia—to enhance sustainable land management, as well as the north's industrial, commercial and economic growth. This would have been done with four research programs.

Sustainable beef production: aimed to enable high standards of resource stewardship and increased production, improved product recognition and value.

Resource access and offsets for major developers and land managers: would have developed options for commercial delivery of environmental services (such as the West Arnhem Land Fire Management Agreement—see story p. 2). These services aimed to produce regional social, economic and environmental benefits, principally through the mining and energy sectors.

Indigenous and remote community livelihoods: aimed to build new and stronger enterprises and employment opportunities for remote communities and Indigenous people.

Indigenous engagement and capacity building: would have matched the above activities to Indigenous aspirations and capacity, and designed projects to increase opportunities for Indigenous participation and development.

Despite this setback, there is still a need for research that addresses these areas, particularly now that there is a new focus on the agricultural potential of north Australia given the dry conditions further south. Research is required that develops and applies innovative technologies and knowledge systems; identifies and analyses economic opportunities arising from provision of environmental services; informs policy and institutional arrangements; builds knowledge, skills and human capability to support regional economic growth; and assesses employment opportunities for local people, and education and training implications.

The experience of the Tropical Savannas CRC has shown that this research can be very productive if it is built around practical experiences in northern Australia, draws on people from different sectors, regions and internationally, and structures research programs to accommodate regional differences. All programs benefit from involving end-users in designing, conducting and implementing research.

The CRC will continue until mid-2008 and will investigate ways to support the research and user engagement model it has established into the future.

Contact: Acting CEO, David Garnett, Email: <david.garnett@cdu.edu.au>

Indigenous Alliance now online

NAILSMA—the North Australian Land and Sea Management Alliance—now has its own presence on the web. NAILSMA was established in 2003 and is a partnership of Indigenous groups from across northern Australia.

The Alliance supports practical Indigenous land and sea management by Traditional Owners in caring for their country. In the past two years it has held two major land management forums—bringing together Indigenous land managers from the Kimberley to Cape York. You can find information on NAILSMA's formation, its objectives, as well as descriptions of its research projects and programs. *Kantri Laif*, NAILSMA's bi-annual newsletter is also online, where you can read about the diverse work being undertaken by the north's Ranger groups and land councils.

NAILSMA's latest reports are online, and all can be downloaded from the site. They include a study into Indigenous people and tropical rivers, a knowledge handbook on marine turtles and dugongs, and a scoping study into the role Indigenous people can play in biosecurity. Strategic discussion papers and reports are also available.

Go to: <www.nailsma.org.au>

Contact: Joe Morrison, Executive Officer, NAILSMA, Tel: (08) 8946 6702 Email: <joe.morrison@cdu.edu.au>

CEO swaps north's savannas for southern forests



Gordon Duff, above, was CEO of the Tropical Savannas CRC between 2002 and 2006

PROFESSOR Gordon Duff, the CEO of the Tropical Savannas CRC, left the CRC at the beginning of October, moving from the savannas of northern Australia to the trees of Tasmania to lead the CRC for Forestry based in Hobart.

He was one of the driving forces behind the formation of the original CRC in 1995, but then migrated south to Victoria, only to return to head up the renewed CRC for Tropical Savannas Management in 2002.

To quote his own words in his first annual report, there has been “a strong desire among many of our participants to move outside our comfort zone and tackle some of the difficult, contested and contentious issues”.

Gordon has both led that movement and challenged those around him to go with him, with the result that we now have the unique network of diverse partners across northern Australia that constitutes the present CRC.

It is worth noting that Gordon is beginning to exhibit a well-defined and quite regular migratory pattern between north and south, and we hope that it will not be too long before he returns to warmer climes.

We wish him every success in his new job and thank him for his outstanding contribution to the people and land of northern Australia.

— David Garnett, acting CEO of the Tropical Savannas CRC

NRM evaluation sets direction for NHT 3

Recent findings from TS–CRC research points to more effective delivery of Natural Resource Management (NRM) investment in northern regions. After three years investigation a clear picture is emerging of the strengths and limitations of the regional planning approach in northern Australia under Natural Heritage Trust 2 and the National Action Plan for Salinity and Water Quality.

The TS–CRC project, *Healthy Savanna Planning Systems*, is led by Prof. Geoff McDonald at CSIRO Sustainable Ecosystems, and has focused on the contribution of regional NRM bodies and government agencies to developing regional NRM plans, engaging stakeholders, forming partnerships, and, coordinating natural resource management activities in their region.

The research findings show the progress made in some 17 Queensland, Western Australian and Northern Territory regions between late 2003 until early 2006. The project team conducted interviews and web-based surveys with planners and managers across the north as well as observing NRM forums and reviewing regional plans and investment strategies.

Successful aspects to regional approach

In most regions, targets and projects were developed with a strong but practical commitment to adaptive management. Local knowledge was also valued highly by regional bodies in developing projects. To be adaptive in this way requires flexibility and independence and the non-statutory status of northern regional bodies generally allowed this.

In NSW and Victoria the catchment management authorities are legal entities with the power to charge rates and taxes and allocate resources. In Western Australia, the Northern Territory and Queensland, a more cooperative model is at work, and the groups work on the good will of rural communities, local government, the tourism industry and other parties with an interest in natural resources.

Regional bodies and stakeholders worked together most effectively where a specific issue or clear problem (such as feral animals) could be identified. Setting realistic expectations and providing benefits for both parties in the short-medium term were also important success factors.

Not all regions equal

This success was not evenly shared across all regions however. In larger regions with relatively limited funds, the cost of involvement for some prospective partners or stakeholders often rivalled likely benefits. This was exacerbated in regions where the decision-making on investment was distant from the sub-regional networks where engagement occurs or where insufficient attention to future viable sub-regional networks was given.

In nearly all regions surveyed, planners and managers believed that adequate information systems to monitor the effectiveness of actions were not yet in place. In particular, clarity on what to monitor and where, who manages the monitoring infrastructure and data, and who pays for it is still a significant and unresolved issue at program, jurisdictional



Members of the Northern Gulf Resource Management Group developing criteria for a devolved grant to invest in pasture spelling, Georgetown, April 2005

Photo: Lionel Pero

and regional levels. In light of this, it is unreasonable to expect regional bodies to deliver ‘quick results’ and report these in rapid fashion to investors.

Implications for NHT 3 design and delivery

The evaluation suggests three core needs must be met if the regional model is to remain viable in northern regions of Australia.

Firstly, there is a need to include stakeholders’ aspirations for sustainable livelihoods in the design and delivery of natural resource management programs—so such programs achieve economic, social, cultural and environmental outcomes. The current arrangements for the National Action Plan for Salinity and Water Quality and NHT, however, restrict regional bodies’ ability to integrate and reflect these values in targets and actions.

Secondly, because it is difficult to demonstrate the effectiveness of NRM management actions on resource condition in the short term, there is a need for an increased focus on cost-effective actions and appropriate monitoring systems that inform local learning and regional decisions.

This raises a fundamental question about how to define and measure cost-effectiveness of these activities in northern regions. In this setting, greater focus on testing the links between actions and outcomes that uses local knowledge and adopts an adaptive approach is needed.

Thirdly, there is a need to get the scale and scope of planning in large northern regions right. Some regions are too large or too centralised to be effective. That is, the size and make-up of some NRM regions under NAP and NHT do not allow planners to work effectively with stakeholders.

Adequately resourcing ‘sub-regions’ so that community and industry engagement and implementation networks are viable in the longer term is also critical to the success of future program design. In 2006–07 the project team is investigating approaches to improve cost-effective delivery of NRM outcomes in regions.

Download reports from the project, including eight regional case studies:

<www.savanna.cdu.edu.au/research/projects/policy_planning.html>

Contact: Bruce Taylor, Project Manager, Healthy Savanna Planning Systems, CSIRO Sustainable Ecosystems, Brisbane

Email: <Bruce.Taylor@csiro.au>

Urban–rural divide gives rise to myths

NEW research that identifies urban concerns about rural land management could help to bridge the urban–rural divide. Dr Bradd Witt, a lecturer and researcher at the University of Queensland’s School of Natural and Rural Systems Management, is leading a team who are exploring urban views of rural land management.

And some of the views held by city folk could come as a surprise to rural residents: for example, the majority of respondents to a survey of Brisbane residents conducted by the UQ research team said they had a high level of trust and support for those working on the land.

However, there is strong concern about the environment and uncertainty as to whether farmers and graziers are managing land sustainably.

The research team mailed out the survey to more than 1000 Brisbane residents in 2005 and had 300 responses—a response rate strong enough to draw some interesting conclusions.

“We asked things to do with how concerned people were, what the issues were facing farmers, whether they trusted farmers, if they thought farmers had the right knowledge to manage the land, what condition they thought the land was in, the role of society, and the trust they had in government to manage the land,” he explained.

While the results for the entire project are still being analysed, according to Bradd, “it’s becoming clear there are a whole bunch of myths and stereotypes on both sides.”

Interestingly, city people on the whole—two-thirds of the respondents—acknowledge that most of them don’t really understand the issues faced by farming people. Nevertheless, there is a genuine concern about the environment, and the challenge for rural people, says Bradd, is how to respond to that concern.

“City people are really concerned about the environment and they know they don’t completely understand the

issues—but they don’t necessarily need to.

“What they need is for someone to reassure them that it is being looked after,” said Bradd.

“To ignore that concern and worry, or to condemn it as ignorance is not the way to go. We suggest that it needs to be acknowledged and confronted.”

The good news however, is that the vast majority of people trust farmers to manage land well and the majority also think that farmers are concerned about conservation.

“Really it’s only a small minority that has absolutely no trust in farmers and thinks that strong land management regulation is needed,” said Bradd.

The survey also found that more than half the respondents had some experience of living in the bush, spent some time there or had relatives there. So there was a strong feeling of connectivity with the bush.

The reason for the team’s work is to explore what is myth and what is reality and inform good communication and government policy. It is unlikely that the concerns city dwellers have about environmental issues and animal welfare are going to go away and Bradd worries that if farmers choose to respond negatively to that concern, they’re going to create the stereotype they’re afraid already exists.

“If they take a more positive approach and be open to discussion, they will not take control of these issues completely, but they will develop a better relationship with city people and start having some degree of influence and control over their destiny,” he said.

Read about the survey: <www.nrsm.uq.edu.au/survey/urbanviews/>
Note that the findings are still being finalised.

Contact: Dr Bradd Witt, University of Queensland, Gatton Campus
Tel: (07) 5460 1064 Email: <bwitt@uqg.uq.edu.au>

Meat & Livestock Australia have also conducted a survey: Read the results at: <www.mla.com.au/TopicHierarchy/News/MediaReleases/Research+shows+urban+opinions+of+farmers+are+positive.htm>

DVD explores rural myths

The Dalrymple Landcare Group has released the DVD *Urban Myths*, a local Landcare initiative that aims to improve communication between rural and urban populations. The DVD explores what many rural communities consider are six common misconceptions held by urban Australians about rural life and land management. The myths discussed on the DVD are:

- Country people don’t care about the environment
- City people understand rural issues
- Rural profits mean environmental losses
- Most of the trees have been cleared
- Country kids all want to live in the city
- Local communities can’t fix the environment

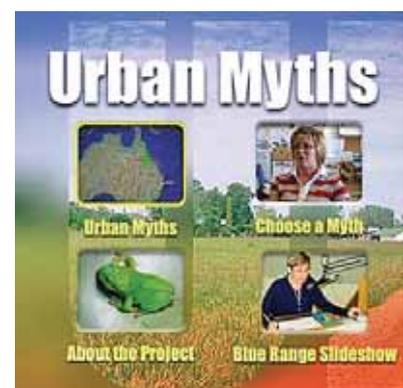
Local landholders from the Dalrymple Shire discuss each of these ideas, and Dr Bradd Witt from the University of

Queensland also shares some of his findings from a survey of Brisbane urban residents. (See story above).

The aim was to create a useful resource for secondary schools in study areas encompassing aspects of environmental and catchment management. The Landcare Group also hopes that the DVD will play an advocacy role with key politicians and urban journalists responsible for addressing environmental issues.

“The vast majority of primary producers are sustainable family businesses planning for the future, who do care for the environment and who do take up new technologies,” said Marie Vitelli, Project Officer with the Dalrymple Landcare Committee.

“It is hoped that improved communication will help break down the emerging urban-rural divide and lead



to informed decisions about future land management practices,” she said. The DVD and web production were developed in partnership with the community cultural development group Feral Arts and local journalist Toni Somes.

Contact: Marie Vitelli, Project Officer
Dalrymple Landcare Committee Inc
Tel: (07) 4754 6120 Fax: (07) 4787 4998
Email: <marie.vitelli@dpi.qld.gov.au>
Web: <www.urbanmyths.com.au>



Photos: Peter O'Reagain

Besides the main grazing trial, Wambiana is hosting many ancillary projects. Pictured above are cattle with GPS collars to enable researchers to explore why cattle select some soil types and not others and how stocking rates affect this selection process. See story on page 10.

Variable rainfall in much of the savannas makes sustainable and profitable grazing a challenge. At a working cattle station near Charters Towers, an eight-year research project has been looking at different stocking strategies to deliver the best outcomes for the land, the cattle and the people.

By Fran Bancroft and Kate O'Donnell.



Top photo: A paddock in 2006 after eight years of heavy stocking compared with this photo, which shows a healthier paddock under a lighter stocking regime

Wambiana: the big picture on grazing

Much of past research in the grazing industry has focused on animal production such as supplementary feeding, early weaning and other measures to maximise livestock production. The Wambiana project has shifted that focus on to the land and sustainable management—by attempting a big picture of the whole grazing system’s response to how we manage grazing lands in a variable climate.

Dr Peter O’Reagain and John Bushell from Queensland’s Department of Primary Industries and Fisheries (QDPI&F) have led the Wambiana grazing trial for the past eight years. The project, is co-funded by QDPI&F and Meat and Livestock Australia, but has also received support from a range of other funding bodies. The project aims to develop a set of best practices and guidelines for graziers and over the life of the project has assessed the ability of different grazing strategies to cope with rainfall variability in terms animal production, economics and resource condition.

A 1041 ha section of the Wambiana property was leased for the project and divided into paddocks to test five strategies. These were heavy and light stocking, rotational wet season spelling, variable stocking based on available pasture and finally, a variable stocking strategy based both on available pasture and Southern Oscillation Index (SOI) predictions for the coming wet season (see box opposite). The trial is not only examining production and economic performance, but

also the effects on pasture composition, biodiversity, woody vegetation and soil and nutrient run-off.

The test area has a highly variable rainfall—the annual average is 653 mm, but the historical range is 109–1653 mm—and most rain falls in January to March. During the first four years of the trial rainfall was good, but has been below average for the last four years giving a good indication of how variable the rainfall can be. The results are providing new facts and figures about sustainable land management.

Results

The Wambiana results clearly show that sustainability and profitability go hand-in-hand in the northern savannas. Light or relatively conservative stocking has consistently given superior individual animal production, a shorter time to turn-off, reduced costs and improved marketability and economic returns. Risk is reduced, land condition maintained or improved and runoff reduced. Variable stocking also performs well, but there is increased risk and an increased level of management is required. Constant heavy stocking performed well initially with the good rainfall, but land condition declined and stock numbers could not be maintained through the dry years without expensive drought feeding.

“In testing heavy stocking we are not recommending it, but we have to know the consequences of applying this strategy,” explained Peter O’Reagain.

Cont page 8

Hosts keen for outcomes on stocking trials

IN selecting the trial site a number of property owners on suitable land types were approached. Of the properties considered, Wambiana was eventually chosen as it had a guaranteed water supply and a good mix of land types. Owners John and Ronda Lyons were interested in the project from the start and keen to see the results of the research.

“I knew we had gone from one era to another [in grazing] and we needed another management system,” explains John Lyons. “The old management system had got us to this stage—but it’s not good enough to take us to the next stage.”

He believes that changes in grazing practice over the past few decades means that for the first time the grazier is in a position to damage the land, especially through over-stocking.

“We had the capacity to really hurt the land for the first time ever—through having too many animals because of supplements like urea and molasses,” he said.

“I really wanted to see the outcome of the stocking rate trials, and some of the newer methods like SOI and rotational spelling.”

According to Peter O’Reagain, the close involvement of graziers with the project since its inception is relatively unusual. A grazier advisory committee was established in 1997 and has played a major role in many aspects of the trial’s management. For example, the stocking rates applied at the trial are largely based on the Advisory Committee’s advice on appropriate stocking rates for the different land types at the site.

“Grazier participation has been critical to maximise relevance to the industry and the potential adoption of project outcomes,” says Peter O’Reagain.



Ronda and John Lyons, who leased a section of their property, Wambiana, for the grazing trial and myriad research projects

“This has also encouraged discussion and debate and is something that all of us learn a lot from.”

One of the project aims was to put ‘facts and figures’ on existing management techniques; to get a better understanding of what many graziers already do.

“We’ve never had the numbers,” says John Lyons. “You can tell a good story in this game, because no one can pull you apart. It’s full of motherhood statements, old stories, nostalgia and tradition—but the industry is now becoming factual.”

After eight years and a range of seasons everyone associated with the project is still keen for it to continue. “Everything in the bush happens on a 30-year cycle; it’s slow out here,” says John. “I would like it to continue for 40 years!”

Strategies tested

(1 AE = 1 Adult Equivalent Beast weighing 450 kg)

1. Heavy stocking: Set stocking (4 ha/AE)
2. Light stocking: Set stocking (8 ha/AE)
3. Rotational Wet Season spelling: Set stocking (6 hectares/AE). Paddock is divided into three with one-third rotationally spelled each wet season (December to June).
4. Variable stocking: Stock numbers adjusted in May based on available forage and set to ensure animals have sufficient feed for the dry season and to leave a minimum residue of 800–1000 kg/ha of pasture. (3–12 hectares/AE)
5. SOI variable stocking: Adjust numbers in November according to available forage and Southern Oscillation Index (SOI) based forecasts for the coming wet season (3–12 ha/AE)

Results

Constant heavy stocking

Initially performs well in good years but ...

- Increases costs and risk
- Reduces individual animal performance and condition
- Increases time to turn-off, resulting in poorer carcass grades, and therefore reduced returns
- Land condition declines and run-off increases
- In drier years carrying capacity declines with negative effect on animal production per hectare.

Lighter stocking

- Superior individual animal production
- Shorter time to turn-off, increased turnover
- Improved marketability and market returns
- Lower costs and risk
- Maintains or improves land condition and reduces run-off.

Rotational wet season spelling

- Good animal performance
- Shorter time to turn off
- Improved marketability
- Land resource improves however,
- Requires flexibility with stocking rates

Variable stocking and SOI

Performs well in most years with good animal performance but ...

- Increases risk and increased management skills needed
- Long-term effect on land condition needs more investigation
- Delays in destocking can seriously harm pasture condition.

—John Bushell, QDPI&F

Several agencies and organisations contributed funding or resources to the Wambiana project: the Tropical Savannas CRC, the Great Barrier Reef Marine Park Authority, the Natural Heritage Trust, the Drought Regional Initiatives and CSIRO.

Open for business: the dividing line between a spelled paddock, right, and one heavily stocked.



Fauna surveys were also conducted at Wambiana to assess the effects of the grazing strategies on biodiversity. Dr Alex Kutt, from CSIRO Sustainable Ecosystems, found that for about half the species (mainly birds and reptiles), there was a clear link between their abundance, grazing strategy and vegetation type. Species such as the variegated fairy-wren that forage and nest in taller grass disappeared from the heavily stocked paddocks. Conversely crested pigeons, granivorous birds and well-known increasers that prefer open cover and bare ground, escalated in number. Some of the patterns were confounded by burning at the trial. Gehyra dubia, an arboreal gecko, decreased across all stocking rates in response to changes in tree density. From a grazing perspective, the more lightly stocked paddocks were the more profitable in terms of standard indicators used for production success and ecosystems services such as run-off and infiltration. The message is encouraging for biodiversity as conservative management is generally considered less cost-effective for grazing enterprise. The Wambiana trials show that production and conservation goals are not mutually exclusive.
— Peter O'Reagain and Alex Kutt¹

From page 6

In low rainfall years, the poor animal production and expense of drought feeding under heavy stocking means that any economic benefit from running more cattle is lost. Land condition also declines and increased run-off means that when rain does fall it does not stay in the land but carries soil and nutrients in to waterways. In the longer term pasture production declines causing a drop in carrying capacity.

Peter O'Reagain sees the results as showing that, despite scepticism from some graziers as being not economically viable, sustainable grazing is the only way forward.

"It's pretty exciting that the trial is showing that sustainable management is not uneconomic but in fact very profitable," said Peter O'Reagain. "It's showing good economic returns for a variety of reasons: better quality of animals, shorter turn-off times, reduced costs and higher rainfall use efficiency.

"Trial data show that over the last four dry years the heavy stocking strategy has run at a loss while light stocking and variable strategies have run at a consistent profit. So any gains from running those higher numbers in the good years are being rapidly eroded away: of course whether this situation reverses when the good years return we just don't know," he said.

Grazing Land Management

The Wambiana trial results are also important in supporting new and existing extension and development programs. One of these is the Edge Network's Grazing Land Management (GLM) workshops delivered by QDPI&F and Meat and Livestock Australia. The GLM package is tailored to each major region to help land managers to manage sustainably and profitably in their own unique set of conditions.

"There is a whole section on management and stocking strategies in GLM, and the main data comparing different management strategies is from Wambiana," points out Marnie McCullough, Extension Officer at QDPI&F. Marnie and other extension officers are working closely with graziers and researchers to ensure that the information and results flow to all parties. "The Wambiana trial is a wonderful resource that we're very keen to promote and encourage people to look at and understand—it's my job to make sure people are hearing about that." According to Marnie, the management strategy that works best depends on the level of management that an individual landholder wants to invest in and their circumstances. "If someone wants minimal inputs, the set stocking approaches are attractive," she explained.

Variable stocking is based on assessing how much feed there is at the end of the wet and adjusting cattle numbers accordingly. Apart from the guidelines and principles from Wambiana, graziers have a suite of existing tools available to help make such decisions including pasture yield standards, the Rainman package, Breedcow and Dynama herd budgeting.

Proactive management

However, strategies like variable stocking are still reactive and stocking decisions are not made until the end of the wet season when, according to Dr Greg McKeon from Queensland's Department of Natural Resources and Water (QDNRW), the damage may already have been done.

"What damages perennial grasses is heavy grazing through the growing season in relatively dry years. So even if stock numbers are adjusted, it is still possible to cause pasture degradation by over-stocking when good seasons are followed by very poor years" he explained.

"Climate forecasting is one tool that managers could use to be more proactive in managing for variable seasons."

At Wambiana the SOI was successfully used to reduce stock numbers before the dry years arrived. Currently, the SOI only has a three-month lead-time, so the cattle were sold in November. Even though this was less than ideal due to poor prices, Peter O'Reagain said the strategy on the whole worked very well.

"The SOI strategy allowed us to cut stock before we ran into trouble with the dry years, as happened under constant heavy stocking. Economically, the strategy performed much better than simply running at a very heavy or very low stocking rate," said Peter.

The SOI strategy was on a par financially with variable stocking, but because of early de-stocking, had better results in terms of pasture condition.

"Ironically, we had a very good wet season at the start of the trial in December 1997, despite initial SOI predictions of a very poor year. By keeping stocking rates low in 1997–98 you could argue there was a potential loss of income," said Peter. "But in terms of land management I don't think so.

"The way I see it, losses from being caught out by drought are far worse than the money you might forgo by not having extra cattle in a very good year."

While the SOI might currently be the best forecasting tool available for Queensland, new forecast systems are be-

Trees keep grazing country fertile

The Wambiana trial also provided a rare opportunity for scientists to study ecosystem functions—and how these functions affect the health of grazing country. One of these projects examined soil fertility in the heavily and lightly stocked paddocks and in a paddock that had not been grazed for over 100 years, located elsewhere at Wambiana. The study has shown that while grazing tends to produce a decline in landscape condition, the presence of trees has a greater positive impact on landscape condition and soil fertility.

Soil fertility was estimated by measuring soil nitrogen (N) which accounts for 80 per cent of nutrients taken up by plants. Most of the nitrogen in soil is in organic form, and has to be converted by soil micro-organisms to inorganic forms such as ammonium and nitrate before it can be used by plants. Concentrations of this inorganic 'plant available' N were highest in the wet season and lowest in the mid-dry season—reflecting the importance of soil moisture in the mobility and availability of these nutrients.

Nutrient, trees and landscape position

Distribution of different plant-available pools of N were also influenced by grazing, tree cover and position in the landscape. In the wet season, concentrations of inorganic N were generally greatest under trees. Ammonium concentrations were higher in grazed paddocks, particularly under the trees in heavily stocked paddocks, compared to the ungrazed paddock. Since the distribution of ammonium in the ungrazed and lightly stocked paddocks was comparatively more even, this may indicate that heavy stocking rates create greater patchiness in nutrient distribution and a greater potential for nutrient loss.

Concentrations of nitrate, which is water soluble and more likely to leach away, were higher in the grazed paddocks than the ungrazed paddock and in the drainage lines of the grazed paddocks. However, in the ungrazed paddock, most nitrate was on the crest and the least was in the drainage line. The higher

vegetation cover in the ungrazed paddock may have aided the retention of the nitrate in the crest zone. Overall variability in the data was great and was indicative of natural variation in soil moisture and vegetation cover in the field.

Landscape condition

Landscape condition was assessed by measuring vegetation and soil crust cover, soil micro-topography and the size and spatial distribution of vegetated and bare soil patches (Tongway & Hindley 2004); these influence the capture and distribution of resources such as water and nutrients.

Results suggested that areas under tree canopies were in better condition than areas outside the canopy in terms of soil stability, infiltration rate, nutrient cycling capacity and soil biological activity. These differences were greater between ungrazed and grazed paddocks than between heavy and light stocking rates. Analysis of nitrogen isotopes in the soil and leaves in the grazed paddocks indicated that more nitrogen 'leaks' out of the system in grazed paddocks, possibly due to erosion or grazing and that trees in the grazed paddocks were not as efficient in using nitrogen as those in the ungrazed paddock. Overall, these results emphasise the importance of trees as zones of fertility and highlights the benefits of having a healthy landscape where topsoil, organic matter, water and nutrients are retained and recycled in the system.— Liz Poon.

References

Tongway, D. J. & Hindley, N. L. 2004, *Landscape Function Analysis: Procedures for monitoring and assessing landscapes, with special reference to minesites and rangelands*, CSIRO SE, Canberra.

Liz Poon is a PhD student with University of Queensland, Dr John Ludwig (CSIRO SE) and Dr Susanne Schmidt (UQ) are Liz's advisers.

Liz Poon, Tel: (07) 4091 6404, Email: <s4057806@student.uq.edu.au>

See the full version of this article in Savanna Links online:

<www.savanna.cdu.edu.au/publications/savanna_links.html>

ing developed for use here and in other parts of Australia. For example, the CSIRO Oceans to Farms project is using Sea Surface Temperature variations to predict rainfall and is using economic modelling to evaluate the usefulness of predictions.

Greg McKeon helped develop the GRASP modelling system that has been in use for many years. He aims to get the model working for the whole of northern Australia and to train people in its use. Similar projects are under way in Australia in NSW and the Northern Territory, and overseas in Zimbabwe where GRASP is used to run management and climate scenarios tailored to these regions. "Part of these studies could involve simulation of the grazing strategies being tested at Wambiana," said Greg. "El Nino affects the climate in many countries. So the idea of linking management to warnings of what's to come, could work around the world."

Pastures can take a long time to respond to management and climate and Peter O'Reagain stresses the Wambiana trial isn't the final word on these issues. However, the data is certainly some of the best available and shows the costs and benefits of different strategies. The important message is not that one strategy is necessarily best, but rather that there are a set of principles and guidelines that can be tailored to particular regions and properties across most of northern Australia.

"From our experiences, I would say your best management must involve spelling and assessing available forage and adjusting stock numbers at least once a year," said Peter. "You should use climate forecasting as an additional tool in making management decisions." Understanding the carrying capacities applicable to your region and land-types is the key.

"Be very careful with your stocking

rate and know what the limits are for your area as you change stock numbers with the changing seasons."

References

1. Kutt, A. & O'Reagain, P. 'Conservation without cost', Kraatz, M., Clark, M., Jacklyn, P. (Eds) (unpublished), in *The Bush Book: A management manual for small areas of native bushland*, Tropical Savannas CRC.

O'Reagain P.J. & Bushell J.J. 2003, 'Effect of grazing strategy on animal production in a seasonably variable tropical savanna', in Proc. VIth International Rangelands Congress, Durban, South Africa, July 2003, pp. 913–915.

O'Reagain P.J., McKeon G.M., Day K.A. & Ash A.J. 2003, 'Managing for temporal variability in extensive rangelands – a perspective from northern Australia', in Proc. VIth International Rangelands Congress, Durban, South Africa, July 2003, pp. 799–809.

O'Reagain P.J. & Bushell J.J. 2003, 'The effects of fire on woodland structure and density in a north Australian tropical savanna', in Proc. VIth International Rangelands Congress, Durban, South Africa, July 2003, pp. 393–395.

Satellites track grazing cattle

COLLARS on cattle fitted with a global positioning system (GPS) are allowing CSIRO Livestock Industries and Queensland's Department of Primary Industries and Fisheries (QDPI&F) scientists to track the movement of cattle in the bush.

The aim of this collaborative research project, also conducted at Wambiana station, is to answer why cattle select some soil types and not others and how stocking rates affect this selection process. Cattle by nature selectively graze different parts of the landscape, leading to over-use and degradation of particular areas and a reduction in the land's long-term carrying capacity.

Direct observation methods of animal behaviour can be tedious, time-consuming and possibly biased by the effects of human observers on grazing behaviour. CSIRO Livestock Industries scientist Ed Charmley points out that the devices allow the location of an animal to be captured every 30 minutes without affecting their normal behaviour.

"Studies with GPS collared animals will also be important in evaluating the placement of additional water points,

fences or other management strategies to manipulate grazing distributions on large, spatially variable paddocks," he said.

The collars have also been used on Roger and Jenny Landsberg's property Trafalgar, near Charters Towers. Twelve cows in a mob, in a paddock of about 1500 ha, were fitted with the GPS collars.

Scientists are now determining if there is any difference in the selective grazing habits between paddocks at Wambiana and the larger paddock at Trafalgar. Comparing the two paddock scales will allow scientists to find out if the spatial relationships between grazing animals and their environment can be scaled up to commercial-sized paddocks.

Co-funded by MLA's Northern Beef Program, the project is designed to help develop new grazing strategies to ensure the long-term ecological sustainability and economic viability of northern savannas grazing.

Contact: Dr Ed Charmley, CSIRO Livestock Industries Tel: (07) 4923 8174; Ms Andrea Corby QDPI&F, Tel: (07) 4722 2648.

Wambiana grazing trial information:

Peter O'Reagain

Email: <peter.oreagain@dpi.qld.gov.au>

John Bushell:

Email: <john.bushell@dpi.qld.gov.au>

Web Links

Meat and Livestock Australia

<www.mla.com.au>

SOI and seasonal forecasts

<www.longpaddock.dpi.qld.gov.au>

Stocktake

<www2.dpi.qld.gov.au/stocktake/17094.html>

BOM Water and the Land

<www.bom.gov.au/watl/ >

Rainman

<www2.dpi.qld.gov.au/rainman/>

Grazing Land Management Workshops

<www2.dpi.qld.gov.au/beef/18481.html>

CSIRO: Oceans to farms

<www.marine.csiro.au/iawg/Public/inventory/Oceans_to_Farms.htm>

CSIRO Sustainable Ecosystems

<www.cse.csiro.au/>

CSIRO Livestock Industries

<www.csiro.au/csiro/channel/pch4e,,.html>

Camels take on Parkinsonia

FIVE years ago, John Lyons bought 60 camels as a way to contain the Parkinsonia invading the floodplains of his property. Wambiana is now home to around 100 camels, all happily munching the weed—and according to John, they are an enormous success.

"We'd done the chemical control, but unless you keep going back and back you lose the first investment," he explained. "The camels, however, just eat all the time—all the seedlings, the flowers as well as breaking the branches."

Wambiana's use of the camels was also studied by John McKenzie at the Tropical Weeds Research Centre at Charters Towers, who looked mainly at the camels' effect on the soil seed bank.

"The biggest effect is a reduction of the seed, so there is less seed going into the soil and therefore reducing the soil seed bank," explained John. "It makes it a very neat integrated management tool for Parkinsonia." Two other weeds camels graze successfully are prickly acacia and chinee apple.

Parkinsonia is capable of producing thousands of seed pods per year, but in the study Wambiana's camels were found to reduce the pods to just one per shrub.

There are risks however. The weed can be spread through camel dung and camels also graze native vegetation. More research is needed in that area, but the many climatic zones and vegetation types of the savannas means that advice for one region is not going to necessarily apply to another. In central Australia, where the camel is a pest, studies



Photo: Kate O'Donnell

Camels on the Wambiana property: after five years at Wambiana, Parkinsonia has been significantly reduced

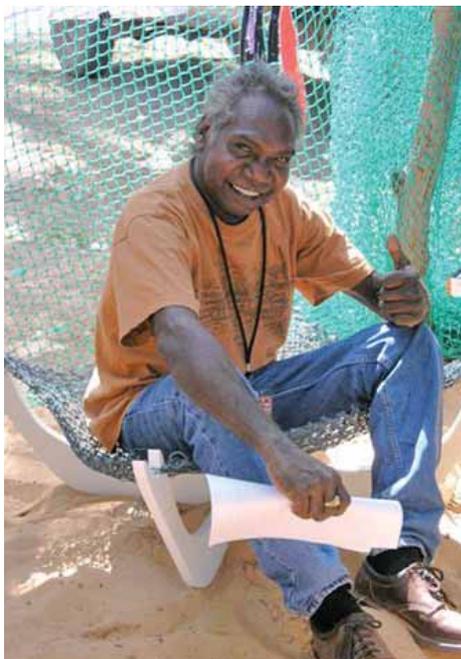
have listed 200 species of native vegetation that camels will graze. But at Wambiana, Parkinsonia is the tippie of choice, edging out most of the native species.

Camels as weed control for Parkinsonia needs careful management, as they will put some pressure on grass stocks and they won't be able to wipe out the weed completely. On the plus side however, they are excellent at controlling regrowth and as John Lyons points out, they work 24 hours a day.

"I haven't been able to employ anyone else who works that way!"

Contact: John McKenzie, Qld Dept. Natural Resources and Water
Tel: (07) 4761 5718 Email: <john.mckenzie@nrw.qld.gov.au>

*Also pictured is Chantal's Afri-Can guitar, made from recycled goods in South Africa. Read more about them at: <www.african-guitars.com/>



Far left, one of the competition judges, Mandawuy Yunupingu (Yothu Yindi lead singer) tries out a chair from the Ghost Net Collection, by second prize winner John Vanzella. Centre is the first prize design, the wonderful guitar strap by Chantal Cordey,* and above is the third prize winner, a shopping bag made by Kristyne Love which features shells and drift net. Photos: Jane Dermer; Chantal Cordey

Art and craft out of destructive drift nets

ABANDONED, lost or discarded, the hundreds of fishing nets that find their way to the waters and shores of the Gulf of Carpentaria pose a real hazard to the six species of marine turtle that breed and nest there. More than a year ago the Indigenous communities of the region began the 'Ghost Nets' programme which not only collects the nets and data about the problem, but is now developing novel ways to put the floating menace to work.

Earlier this year, the Carpentaria Ghost Nets program ran a competition to find uses for the miles of nets that wash up on the shore and the winning designs—announced in August at the annual Garma festival in Arnhem Land—included a guitar strap, chairs, bags, fruit bowls and kitchen hangers.

Criteria for the products entered were that they re-used ghost nets, could be easily manufactured by community groups and have retail value for resale as communities can sell their products through the Internet or local markets.

The winning design was awarded to Chantal Cordey, whose guitar strap, pictured above centre, incorporated thongs, plastic bags and the inner tubes of tyres—all of which are regularly found washed up on beaches—in the design.

It also made use of the extensive weaving skills that exist in communities around the Gulf.

The Ghost Nets programme came about because Indigenous Sea Rangers noted that turtles were being caught in the nets with many marine turtles becoming trapped and dying. According to the program's website, nearly all of the marine debris entering the Gulf is related to fishing and originates from all parts of South East Asia. Once the nets enter Gulf waters, they are caught in a circular current; washing ashore, going out to sea and then washing to shore again.

Since 1996, 205 stranded turtles have been recorded on Cape Arnhem alone, including four of the marine turtle species listed as either endangered or vulnerable under Australian legislation. The floating nets also create havoc with navigation and the safe operation of vessels at sea as they get caught up in propellers, rudders and even engine intakes. To date, more than 200 different types of nets have been identified.

Carpentaria Ghost Nets website: <www.ghostnets.com.au>

More information: Jane Dermer, Project Facilitator Tel: (08) 8987 3992 Email: <jane@dhimurru.com.au> or Riki Gunn, Project Coordinator Tel: (07) 4745 9661 Email: <riki@ghostnets.com.au>

Handbook on turtle and dugong management

THE North Australian Land and Sea Management Alliance (NAILSMA) has produced a handbook on marine turtles and dugongs.

The *Dugong and Turtle Knowledge Handbook* introduces the scope of Indigenous knowledge and values relating to dugong and marine turtles in Australia and provides examples from selected Indigenous groups across the north. Information presented is limited to Indigenous knowledge and values that are already in the public domain.

Methods used by scientists to study

dugongs and marine turtles are also covered, as well as legislation, policy, conservation status and management initiatives relating to dugongs and marine turtles in Australia.

The Handbook is part of a program coordinated by NAILSMA to support Indigenous groups, communities and organisations across the north in managing dugong and marine turtles, including continued sustainable hunting.

Download the report: <www.nailsma.org.au/publications/knowledge_handbook.html>

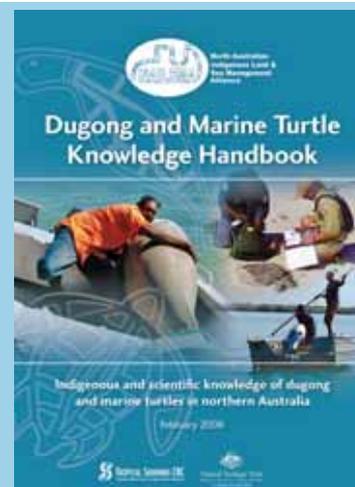




Photo: Deb Bisa



Photo: Garry Cook

Left, cleaning up in Maningrida—African mahogany proved vulnerable to Cyclone Monica. Above, bark stripped from trees in Kakadu National Park.

Storms give insight into savanna patterns

At the beginning of 2006, two of the most severe cyclones in decades affected Australia's north: Larry and Monica. Devastating as the storms were, they are providing an opportunity for us to learn more about how cyclones affect the dynamics of the savannas.

While Larry struck near Innisfail wreaking havoc along the wet tropics, Monica tore a path through Arnhem into the savannas—and was possibly one of the most severe cyclones to affect the Australian coastline in recorded history. The eye crossed the Arnhem Land coast about 35 km west of Maningrida on 24 April 2006. The Maningrida airport recorded a maximum wind gust of 150 km/hr, but near the eye, gusts of up to 350 km/hr were estimated.

Researchers from NT Department of Natural Resources, Environment and the Arts (NRETA), Bushfires NT and CSIRO are now taking the opportunity to study the after-effects of Cyclone Monica on savanna vegetation and wildlife. Researchers flew over Cyclone Monica's Top End path to map the destruction left in her wake. NRETA spatial scientist Craig Hempel estimated the area of greatest destruction to be about 7000 square kilometres in Arnhem Land, encompassing a large part of the Goomadeer River catchment between Maningrida and Jabiru.

"The destruction ranges from coastal mangrove habitats, Melaleuca swamps, sensitive sandstone country and through Eucalypt woodlands," Craig said. "In the worst affected areas, 90 per cent of the vegetation was destroyed. In many areas only partial tree trunks remain, in others there is complete defoliation.

"It will take decades for the environment to recover from a cyclone of this intensity and management of the area is crucial to ensure recovery happens."

There is also concern about the long-term impacts of fire on cyclone affected areas. NRETA Bushfires NT scientist

Andrew Edwards said the damage the debris left in the wake of Cyclone Monica had increased fuel loads for fires.

"With the fire season upon us, an increase in fuel loads will cause fires of increased intensity and this could have implications for the recovery of the area," he said.

"The example of the effects of Cyclone Ingrid on Cobourg Peninsula in early 2005 showed that vegetation only has one chance to recover after such a destructive event. Fires of greater intensity occur and prevent trees from re-shooting.

"If the area does not recover the native vegetation has the potential to be replaced by weeds, such as gamba and mission grasses that could dominate the area and further suppress the re-introduction of native species."

The maps produced from the survey will allow scientists to quantify the disturbance to each habitat in relation to wind direction and intensity.

"This will help build a picture of what role these events have in shaping the coastal landscape and focus management on sensitive areas," said Craig.

Andrew Edwards said the information gathered from the survey has influenced fire management this year.

"When we saw the serious extent of destruction we gave advice to park managers, Aboriginal rangers in Arnhem Land and Bushfires NT operational staff who have created strategic burning regimes to reduce fuel from debris in the area," Mr Edwards said.

"We have tried to strategically burn parts of the area in an effort to prevent wildfire," he said. "The aerial survey is the first step in assessing the type and extent of damage and will provide a basis for further studies into the cyclone's impacts."

Call for information on tree resilience in cyclones

ECOLOGIST Greg Calvert is keen to hear from people regarding tree loss and resilience during Cyclones Monica and Larry. Greg is planning a book on cyclones and trees, how to minimise damage to house and property through good plant selection and gardening practices.

The book will list good tree and plant choices for urban gardens in northern Australia and those which are not so good. The choices will be based on information collected from several cyclones including Tracy, Althea, Charlie, Justin and Tessi as well as the latest two.

The projected book will also discuss ecological impacts of cyclones; how cyclones contribute to the structure, dominance and diversity of different ecosystems, and the land management challenges presented by cyclones.

Greg, who is currently based at Jabiru, has conducted a recent survey of around 400 fallen trees around the township. Jabiru suffered the last dying gasp of Monica, so it was around a Category 3 by the time it hit. It still had the energy to lay waste to most of the town's shallow-rooted African mahogany, as well as numerous black wattles and river red gums.

Many tropical towns and cities are assessing the cyclone resistance of future plantings in the wake of these cyclones,"

Greg said. "The aim is to minimise damage caused by falling trees while at the same time acknowledging the value of some resistant trees in preventing damage—by catching flying debris and acting as wind breaks."

As far as good species goes, research is showing plants that have evolved in high-energy environments, such as those that grow along the edges of fast-flowing rivers and streams tend to be very resilient towards cyclones.

"These plants are subjected to battering by floods and tend to have very strong root systems and seem flexible enough to move and bend," explained Greg. "Also there are species that will sacrifice small branches which reduces their wind resistance; some trees will lose their entire crown, which is not a bad sacrifice if you get to keep your roots in the ground."

Species choice is just one element though; trees can also be made vulnerable due to poor garden management such as shallow watering or factors such as termite damage.

"For every one of these trees that you see doing well, you also see examples of where they've gone horribly wrong!" said Greg. "It's a risk assessment that everybody needs to make on their own houses. With some trees the consequences are high."

Contact Greg Calvert: <gregor_calvert@hotmail.com>



Photos left and below: Garry Cook

Photo: Greg Calvert

Above, a Darwin woollybutt lands on a car in Jabiru. Centre above, a dragonfly is flattened by the force of the cyclone into bark, and at right a lone parrot

The damage done

More recent on-ground work by the Djelk Rangers and Staff of Bushfires NT, NRETA and CSIRO has estimated tree damage from the cyclone. Near Maningrida airport, about 20% of savanna trees were snapped off or toppled by the cyclone. This proportion grew quickly towards Junction Bay where the eye crossed the coastline. Here about 80% of trees were knocked down. Many of those still standing had been rattled to death, with the bark stripped off and the fine roots broken. Long-term plots have been established to monitor recovery of the vegetation.

Cyclones possibly have had a much greater role in the dynamics of savanna vegetation within 100 to 150 km of the coast than has been previously recognised. This research

will enable the relationship between wind speeds and tree damage, and the role of severe winds in tree dynamics, to be assessed.

The cyclone may have an upside for some of the region's wildlife. Because of the massive destruction, there are now greater numbers of hollows and logs, used by many species of wildlife as habitat.

The mapping information will be used by organisations including the Bureau of Meteorology, CSIRO, Charles Darwin University, Parks North Australia and traditional owners, who will work in collaboration with the NT Government to further investigate the type and extent of the damage to ecosystems within the area to aid future management.

More information: Garry Cook: Email: <garry.cook@csiro.au>

Cyclone damage from Cyclone Larry in the South Johnstone and Atherton Tablelands



Photos: Kate O'Donnell

Wet tropics focus of post-Cyclone Larry research

Severe Tropical Cyclone Larry crossed the tropical north Queensland coast near Innisfail during the morning of 20 March, 2006.

Major damage to homes and other buildings was caused by Larry as well as extensive damage to local crops. Larry was quite small (like Severe Tropical Cyclone Ingrid that crossed the coast near Cooktown in March 2005). Major damage was along the portion of coast between Cairns in the north and Cardwell in the south.

Fortunately Larry crossed the coast on a neap tide, so the significant storm surge and waves only caused the sea level to exceed the heightened astronomical tide in a few locations and resulted in only minor salt water inundation. — Bureau of Meteorology <www.bom.gov.au>

Research

Much of the post-cyclone research regarding Cyclone Larry is focusing on the wet tropics. Research includes the recovery of endangered ecosystems,

cassowary habitat, bird communities, and impacts on rainforest fragments and wildlife species. Assessment by satellite and remote sensing is also tracking the recovery of the rainforest. Photo monitoring points have been established to study greater fuel loads for fire management.

A variety of organisations are involved in the research including James Cook University, Griffith University, University of Queensland, CSIRO and Qld Parks and Wildlife Service.

Where are the missing flying foxes?

UP to 200,000 spectacled flying foxes that took flight in the aftermath of Cyclone Larry are still missing—and they could be anywhere from Cape York to Townsville and as far inland as Chillagoe. Atherton-based CSIRO zoologist Dr Louise Shilton is investigating how the animals responded to the cyclone, and needs help from the community to find out where the bats have gone.

“From our monitoring program in the Wet Tropics over the last two years, we know we are only recording one-third of the number of bats we would normally expect to see at this time of year,” she said.

This bat species has generally been regarded as relying on rainforest for its food and habitat, but new research has revealed that they may well be able to survive on a much more varied diet. “They’re feeding not only on the blossoms of rainforest species, but on a whole range of oak and eucalypt woodland and melaleucas as well,” explained Louise.

It’s also possible that spectacled flying foxes are roosting and moving around with black flying foxes or the smaller red flying fox. So, how to tell the difference?

Spectacled flying foxes have a pale mantle of fur around their neck and under their chin and sometimes, but not always, around their eyes. They are similar in size to the black flying fox, which is a solid dark colour. The red flying fox is smaller than the other two, and its wings are more translucent.

“We are appealing to members of the public to report any



Photo courtesy of CSIRO

Thousands of spectacled flying fox have been missing since the cyclone

unusual flying fox sightings, even if they are not sure what type of flying fox they are, we’d like to know where and when flying foxes have been seen,” Louise said. “Flying foxes can create problems in orchards and the urban environment—any information we receive now may help us manage possible problems in the longer-term.”

The research is being funded by the Tropical Landscapes Joint Venture between CSIRO and James Cook University, and is part of an initiative headed by Prof. Steve Turton to examine the environmental impacts of Cyclone Larry.

Contact Dr Louise Shilton, CSIRO Sustainable Ecosystems, PO Box 780, Atherton, QLD 4883 Tel: (07) 4091 8824 Email: <louise.shilton@csiro.au>

A recently completed project worked with two Aboriginal-owned cattle properties in the East Kimberly—Violet Valley Aboriginal Reserve and Bow River Station—to bring together cultural and natural information in land management plans.

The result was new opportunities to expand business while protecting cultural values.

Nadene Schiller reports.



Collecting cultural information with the Violet Valley community on the Violet Valley Aboriginal Reserve.

Cultural planning adds to business success

In a first for the East Kimberley, the project and the communities brought together cultural and natural information in the plans

The project, *Integrated Natural and Cultural Resource Management (INCRM) options for pastoral properties in the East Kimberley*, began in 2004 and is a first for the region. It follows on from the earlier Ord-Bonaparte Program (OBP) which investigated how natural resources could be managed more sustainably in the East Kimberley and across Northern Australia, with a particular focus on Indigenous properties.

Engaging people in the local communities with the new project was paramount and much thought and consideration went into the choice of the properties and communities that would be approached to take part.

The project was funded by Land and Water Australia, Tropical Savannas CRC, the Indigenous Land Corporation, the Department of Agriculture and Food and the Kimberley Land Council.

Mapping country

One of the first steps was to identify community aspirations upon which the land use opportunities would be based. Another initial task, in early 2004, saw the Western Australian Department of Agriculture and Food (DAFWA) work to produce useful maps of the different types of country found on the two properties. This land unit mapping was important because if the land use planning was to be effective, more comprehensive and detailed soil and landscape information than was available was needed. In particular the land unit maps were very important in planning new areas for pastoral production and redefining what cattle different country could carry.

Then, in 2005, working together with community members, DAFWA collected additional information on natural resources and the cattle enterprises for the two properties.

This included:

- Land condition assessment.
- Environmental observations (weeds, pests, feral animals).
- Pastoral enterprise particulars (history, pastoral management, resources).
- Fire management information (fire history, fire management, resources).
- Plans for updating existing and installing new infrastructure.
- People audit and aspirations.

This information was collected on field excursions and through formal and informal discussions and meetings and workshops. Expert advice came from DAFWA staff and specialists in the fields of Biosecurity, rangeland, and fire and station management.

The managers of the properties, Bruce Thomas at Violet Valley and Michael Ramsey at Bow River, were essential to the work, providing advice and information and helping to organise meetings and workshops. The communities were kept informed through regular informal discussions and meetings.

Cultural Information

The Kimberley Land Council (KLC) began working with the INCRM project in late 2004. The KLC's role in the project was to develop relationships with community groups and collect the cultural information on the case study properties.

Once trust and respect were established, it was possible for the project officer to collect cultural information. The cultural information collected included burial sites, birth sites, initiation areas, creation stories, hunting and fishing areas, bush-tucker areas and other areas of cultural significance.

In addition the current risks and management issues of the cultural sites were also collected so that land use opportunities could be determined.

This work was followed by the critical process of integrating the natural and cultural datasets. Once the information was integrated and conflicts were resolved, the final plans and associated maps were developed.

Outcomes for Violet Valley Aboriginal Reserve

Increasing pastoralism—The property has the capacity to build on its current pastoral enterprise and to run significantly more cattle. Three new areas for development of the pastoral enterprise were identified and the associated infrastructure requirements to support these areas and associated cattle breeding strategies were planned and mapped.

Tourism—Several cultural sites were identified that could support a tourism and cultural awareness business. These include bush tucker areas, sites with engravings and markings and other sites of significance.

Other land uses—In addition to the new pastoral areas identified above, two other grazing areas were identified. One of these included an area of cultural significance and the other lay within a current mining exploration tenement. It was resolved that the cultural and mining significance of these areas was greater than their pastoral significance.

Skills training—It was identified that training was required in skills such as fire management and business management, which would support the current and future tourism and cultural businesses.

Addressing management concerns—Fire, and its impact on bush tucker, was an important issue for the community. It was decided that particular bush tucker areas were to be managed (e.g. with fire breaks and planned burns) to protect the food plants. Dog baiting was also an important issue on the property. It was resolved that particular areas would become exclusion zones from baiting to ensure safety for people and valued sites.

Outcomes for Bow River Station

In the case of Bow River station, a fire management plan was the first outcome of the work here as this had been a recent request from the Pastoral Lands Board.

The plan was developed through numerous informal and formal discussions with the Bow River community at which the following points were discussed: historical burning; present burning; burning on different ‘country’ types; fire management resources; fire affected areas and fire frequency mapping; and current fire ideologies. The community agreed about the need to undertake activities on the property to target the fire management problem using their cultural management practices as well as adopting conventional fire management practices. The final plan completed for the station incorpo-



The community gathers to assemble and collect cultural information at the Violet Valley and Bow River Aboriginal Reserves

rated cultural aspects and indigenous management of fire into a pastoral-based fire management plan. A property land use plan has now been completed for the station.

Conclusions

The project has shown that natural and cultural information can be integrated so that existing enterprises can expand and new opportunities developed while protecting cultural values. A collaborative approach between organisations is critical to the success of a project like this.

The research process will also be documented in a publication. This should help other Indigenous property owners in the East Kimberley operating under similar circumstances, as well as research organisations who may support similar projects in the future.

Contact: Nadene Schiller, Research Officer WA Department of Agriculture and Food, Kununurra District Office.

Tel: (08) 9166 4009 Fax: (08) 9166 4066

Email: <NSchiller@agric.wa.gov.au >

Adaptive management for Daly River group

THE Daly River Management Advisory Committee (DR MAC) has been created to work with relevant Government agencies to develop options for the sustainable use and conservation of natural resources within the Daly River region.

The fundamental goal will be to promote the highest standards of management of land, water and other

resources in the region so that important values identified by residents and the wider community are protected.

The committee will build on the work of the Daly Region Community Reference Group, in particular following up the Group’s recommendation to use an adaptive management approach to the Daly.

DR MAC is expected to directly

influence the management of the region through its input to decisions on resource use and conservation. The Committee will also provide advice for longer-term management options to be considered by government.

Go to: <www.nt.gov.au/nreta/naturalresources/plans/dalyregion/>

Contact: Darlene Lion, Tel (08) 8999 3448
Email: <darlene.lion@nt.gov.au>

Funding to tackle Burdekin land degradation

THE Burdekin Dry Tropical Natural Resource Management (BDTNRM) is funding Dalrymple Landcare Committee to the tune of \$1,094,380 to tackle land degradation in two high-priority areas in the Burdekin Dry Tropics region: the east Burdekin (Mingela to Mt Coolon) and the Clarke River Catchment (south-west of Greenvale).

The funding will provide Grazing Land Management training for graziers (in conjunction with the Queensland Department of Primary Industries & Fisheries) and on-ground works to accelerate improved land management practices—including managing riparian areas, wet season pasture spelling, conservative stocking rates, use of fire, protection of endangered ecosystems and critical habitat and reclaiming specific degraded areas.

These areas have been identified as sources of high sediment loads contributing to the reduced water quality in the Burdekin Basin.

The east Burdekin includes 68 properties covering 1,000,000 ha while the Clarke River catchment includes 25 properties covering an area of 650,000 ha.

Pasture degradation, declining biodiversity, high levels of erosion in 'hot spots', emerging woody weed problems, overgraz-



From left, Bob Shepherd from DPIF in Charters Towers looks on as Sue Bennetto, Dalrymple Landcare Chair, and Bob Frazer, CEO, BDTNRM, sign the contract

ing and woodland thickening have contributed to poor water quality being generated in the two areas.

Contact: Deborah Cavanagh, <deb.cavanagh@bdtprm.org.au>
Web: <www.burdekindrytropics.org.au/>

Spotting weed invader from space

DR Roger Lawes, a CSIRO scientist working with the CRC for Australian Weed Management, and Dr Jeremy Wallace of CSIRO are using images provided by the IKONOS satellite to map the spread of prickly acacia (*Acacia nilotica*) across Australia's northern grasslands. From space, prickly acacia has a recognisable 'signature' that is picked up in satellite images. "The images are so precise we can see the advance of prickly acacias into the Mitchell grass country," Dr Lawes said. "This gives us a reliable indication of what is happening over large areas. It can be used as an early warning system to detect new invasions. If we detect a change in the index, we can have a look on the ground and take the necessary steps to control the outbreak."

The technique can also be used to monitor other changes in perennial vegetation across the landscape. The technology was developed using a combination of remote sensing, ground surveys and detailed data analysis. Ikonos has a one-metre pixel resolution and anything larger than one square metre can be detected. Acacia trees have a canopy of up to five metres, so individual trees are easy to see.

"This means that we can accurately count the number of trees in a given paddock," Dr Lawes said. For broader-scale work, Landsat images are used with a 25 m pixel resolution. While the project results are yet to be published, the software behind the technique is available to interested parties.

Dr Roger Lawes, Weeds CRC, CSIRO SE

Tel: (07) 4753 8537, (07) 4753 8600

Peter Martin, Weeds CRC, Tel: (08) 8303 6693

Web: <www.weeds.crc.org.au>

Kimberley fire research

SATELLITE technology will be combined with field observations in a major research project aimed at providing a

greater understanding of the impact of fire on the Kimberley environment.

A joint project between the WA Department of Environment and Conservation (DEC) and CSIRO Division of Sustainable Ecosystems, the first phase of the research will use satellite imagery to map fire scars from previous bush fires across the Kimberley. This will enable researchers to classify areas according to the seasons they were burnt, the number of times they have been burnt and the period of time since the last fire. Researchers will follow up with on-the-ground sampling to record biodiversity values, particularly plant and insect life.

Contact: Dr Ian Radford, DEC, <ian.radford@dec.wa.gov.au>, Alan Andersen, CSIRO SE, <alan.andersen@csiro.au>

Push to rehabilitate rivers

A PARTNERSHIP between Greening Australia, corporate sponsors, including Alcoa, and catchment management authorities and the Federal Government will rehabilitate nine of Australia's icon rivers. The 10-year national River Recovery program will coordinate rehabilitation activities along many rivers including the Coliban and Katherine in the NT and the Burdekin in Queensland.

<www.greeningaustralia.org.au/GA/NAT/OnGroundAction/River+Recovery/>

Sea country management

The DHIMURRU Sea Country plan identifies opportunities for cooperation in marine and coastal management using traditional knowledge and contemporary science. The plan calls for the engagement of both the Australian and Northern Territory Governments as well as non-government interests in the future management of marine and coastal areas for which Yolngu people have custodial responsibilities.

Go to: <www.dhimurru.com.au/>

PhD student *Annemarie van Doorn* has studied one of northern Australia's endemic bird species—the Purple-crowned Fairy-wren—along the Victoria River for the past five years.

Her findings will underpin a new management plan for the bird in the Northern Territory, and one that coincides with good land management practice: controlling erosion and weeds in riverside areas



All photos Annemarie van Doorn

At left, the Male Purple-crowned Fairy-wren and above a female banded for the study. Some significant threats to the wren's survival were identified by Annemarie's study and included weeds, erosion, fire and grazing.

Wrens' precarious hold on the Victoria River

The western sub-species of the Purple-crowned Fairy-wren (*Malurus c. coronatus*) lives in riverside vegetation in northern Australia from the Kimberley in Western Australia east to the Victoria River District in the Northern Territory.

However, its presence is patchy, and it is currently listed as a vulnerable species. This patchy distribution has been attributed to both habitat degradation and alteration (Garnett & Crowley 2000, Rowley & Russell 1993).

As the wren is restricted to riparian habitat it is a good candidate for studying the impacts of some of the primary threats to biodiversity in northern Australia. There has already been one previous study, however, in habitat decidedly different from the one it occupies along the Victoria River (Rowley & Russell 2003).

Purple-crowned Fairy-wren habitat

In the Victoria River District the wren occupies river grass (*Chionachne cyathopoda*) sometimes in conjunction with northern cane grass (*Mnesithea rottboelioides*).

River grass forms dense stands along the Victoria River and its tributaries and is often referred to as cane grass, however this term has been used for a multitude of riverine grasses causing some confusion in the past. The Purple-crowned Fairy-wren depends heavily on this grass for breeding, foraging and cover; it was not found in areas without river grass coverage.

Because so many areas along the Victoria River are difficult to access, in the past the extent of river grass coverage could only be estimated. However, a helicopter survey conducted during this study found that river grass does not occur in a continuous stretch but is highly fragmented consisting of multiple patches of varied quality.

This poses a major problem to the long-term viability of the wren, as it has limited abilities to disperse. However, the largest and healthiest patch of river grass occurs within Gregory National Park where park staff are working to preserve this species and its habitat.

Threats to the population

The primary threats to populations of wrens include grazing, weeds, erosion and fire. These threats are confounding and often have cumulative effects. In particular, intense grazing at unfenced sites was identified as the primary threat to the population. The effects of grazing were most noticeable during the end of the dry season when cattle tended to congregate along the riparian corridor and caused significant damage to river grass stands. During Annemarie's study where two previously ungrazed sites were subjected to intense grazing, there was at least a 50% reduction in the abundance of Purple-crowned Fairy-wrens. This decrease can be attributed to a lack of cover which ultimately reduced forage and breeding opportunities as well as increasing predation rates.

Cont Page 20

All about the Fairy-wren

The Purple-crowned Fairy-wren is territorial, chooses a single mate and lives in pairs or small groups (often holding the same territory for consecutive years). However, towards the end of the breeding season larger groups may be encountered when the juveniles of the year are still with the parents.

Only the dominant male and female breed but other group members may help in caring for the young; feeding and protecting them. Males are most often helpers as females tend to leave the nest earlier. Young males may stay in the parental territory for a long time and may inherit it.

In the VRD, nesting began in March at the end of the wet season with a peak in May. The last nest was found in September. Only females build nests and incubate the eggs but the male can often be seen accompanying the female back and forth to the nest (especially during building). He will frequently feed the female.

They build a dome nest that in the VRD is predominantly located in river grass and built almost entirely out of the same grass. On average nests are 40 cm high.

Average clutch size is three chicks, and groups may produce more than one brood in a season. Females will often re-nest after a nesting failure (up to four times). Foraging for insects is often done in family groups and predominantly in river grass (59% of foraging observations).



The top photo shows an eroded area along the Victoria River, ripe for invasion by weeds such as noogoora burr and castor oil plant. The healthy stand of river grass shown in the bottom photo is needed by the wren and will also help stabilise river banks, which in turn will help prevent weed incursion and provide habitat for other birds such as the Yellow-rumped Mannakin.

Crocodiles and wrens: healthy grass needed

Janelle Pugh and her family manage the Coolabah Crocodile Farm on the Victoria River where Annemarie has had some of her study sites. Janelle has followed the project with interest, and the management plan that aims to protect the bird may also help with her own business.

While the business breeds crocodiles, many of the eggs are taken from the wild, so any land degradation, especially the presence of weeds, all impact on the health of the nesting.

“The crocs have their favourite grasses—composting them into the nesting material—so if there are lots of weeds they’ll tend to use more mud, so incubation is not as effective,” explained Janelle.

Janelle has already begun maintaining an area for the birds by fencing the one-kilometre area of river frontage on the property, some of the funding for which has come through the Victoria River District Conservation Association.

Janelle also has been working to eradicate weeds in the area—no small task considering that the two floods in the region this year have brought the weeds back stronger than ever.

“We’re not planning on having a lot of cattle on our block, so it was probably easier to maintain an area for the birds here,” she said.

The fencing keeps out the family’s pet buffalo and five horses; along with wallabies and neighbouring cattle.

“The cattle can make huge tracks through there and weeds can overtake the area. There’s a lot of wallabies running through the grass and destroying it—the wallabies come in after something else has made the tracks through the grass.”

Janelle’s farm was open to the public at one stage, and many of the tourists were bird watchers.

“We’re very aware of what’s around us all the time and we have lots of birds—especially a lot of the small birds, such as finches.”

“It’s been fascinating; I was quite interested to see what she was doing—it made us more aware of what things to look for when we were in the bird’s habitat.”

References

Garnett, S.T. & Crowley, G.M. 2000, 'The Action Plan for Australian Birds', Environment Australia, Canberra.

Rowley, I. & Russell, E. 1993, 'The Purple-crowned Fairy-wren *Malurus coronatus*. I. History, distribution and present status', *Emu*, 93:220–234.

Project Details

This collaborative project was funded by the Victoria River District Conservation Association, TS–CRC, and the School for Environmental Research, CDU. Additional assistance by Gregory National Park and Biodiversity Conservation Unit of NT Dept. Natural Resources, Environment and The Arts. Research was conducted in partial fulfilment of the PhD through the University of Florida (Supervisors: Dr Patricia Werner, Dr John Woinarski and Dr Barry Brook).

Contact: Annemarie van Doorn

Email: <avdo15@bigpond.com>



Annemarie van Doorn conducted aerial surveys of the extent of river grass along the Victoria River District

From page 18

Weeds were abundant in the river grass habitat, in particular noogoora burr (*Xanthium strumarium*) and castor oil plant (*Ricinus communis*) were present at all research sites. Although the Purple-crowned Fairy-wren did forage among these species, in particular noogoora burr, it only did so during the short period that the plant was green (at the beginning of the dry season). However, once this species dries it provides no cover or foraging opportunities and at no time of the year was it an adequate nesting substrate.

Both these weeds are more prolific in open and disturbed areas and especially in areas where intense grazing has led to an increase in the percentage of bare ground. In addition to weeds, erosion is widespread in the Victoria River District and has no doubt been exacerbated by the large floods in recent years. River grass regenerated quickly after flooding, however once the root base has disappeared re-colonisation—based on seed propagation alone—takes much longer.

Only one fire was witnessed during this project which resulted in low adult mortality, mainly due to the small area affected. River grass regenerated very quickly after the fire and the area was re-colonised within one breeding season. For

the majority of the year, river grass does not burn easily but a fire at the end of the dry season can result in a widespread burn, particularly in an area of dense river grass with high connectivity such as in Gregory National Park.

Future outlook

Conservation of river grass will have widespread positive outcomes in the Victoria River District in addition to conserving Purple-crowned Fairy-wrens and providing habitat for other species, such as the Yellow-rumped Mannakin (*Lonchura flaviprymna*). In addition to species-specific effects, river grass can also help stabilise riverbanks as well as reduce the amount of bare ground available for weeds to establish. Greening Australia is currently investigating propagation techniques for river grass to enhance future rehabilitation efforts.

More fencing and better erosion control in combination with increased interest in this species on the district's properties mean some of the threatening processes could be reduced or reversed. A comprehensive management plan is being developed using the findings of this study. This plan will provide valuable management options to conserve River Grass and Purple-crowned Fairy-wren habitat in the VRD.

Desert Uplands Strategic Land Resource Database

AFTER six years' work, the Desert Uplands now has its own land resource database with all land types mapped at a consistent scale across the whole bioregion. Land types are described in terms of their inherent characteristics, their implications for land use and any special features. The database is available on two CDs.

Disc 1 is designed for the majority of clients. It contains information sheets and maps at a scale of 1:100,000 for all the land systems, land units and individual field sites within the region, photographs to complement all the

sections of the report, and an overview report containing a regional perspective of the climate, geomorphology, soils, vegetation and land management units. Disc 2 is in Microsoft Access format and allows the client to interrogate, extract and use any of the data from Disc 1.

The database provides the best available resource information for land use and management planning, as well as providing a basis for new research, monitoring and mapping. It marks the conclusion of a major land resource study for the region by the Environ-

ment Protection Agency (Townsville) in partnership with the Desert Uplands Buildup and Development Strategy Committee (DUBDSC), together with support and interest from many organisations and individuals.

CDs are available from the EPA Customer Service Centre, 160 Ann Street Brisbane QLD 4000 or DUBDSC, PO BOX 310, Barcardine QLD 4725 <www.desertuplands.org.au/>

For questions on the database: <gis.northern@epa.qld.gov.au> More information: Mal Lorimer <mal.lorimer@epa.qld.gov.au>

Weeds rampant: from hungry geese to scorching fires

THE main reasons for the global weed explosion are global trade, the atmospheric increase in CO₂, human interference in the nitrogen cycle, and climate change—says US scientist Prof. Hal Mooney of Stanford University, who gave a keynote address to the recent 15th Australian Weeds Conference held in September in Adelaide. Since 1788, more than 30,000 species of plants have been introduced to Australia, mostly ornamentals, and 3000 of which are now reproducing freely in the wild. One that was introduced for its excellent pasture attributes, rather than its looks, may now actually have initiated a grass–fire cycle in the Northern Territory. Researchers from Charles Darwin University presented findings that showed over the past 12 years there had been a significant reduction in tree canopy from scorching gamba fires in their study site—meaning that this local impact could be happening on a landscape scale.

Contact: <Samantha.setterfield@cdu.edu.au>

Magpie geese and para grass

KAKADU's immense flocks of wild magpie geese are under increasing threat from para grass—originally imported as a ponded pasture for cattle—because it is replacing native wild rice, a staple food for the goose. In research presented by Dr Penny Wurm (Charles Darwin University and TS–CRC), Dr Sean Bellairs and Beckie Kernich (CDU), Penny revealed that para grass dominates wild rice by shading the soil, preventing the rice seed from reaching the temperature it needs to break its dormancy. The grass readily escapes into the wild and invades floodplains, displacing wild rice, as well as native water chestnut, driving the magpie geese from their once productive feeding grounds. One study on the Magela Creek floodplain found that the distribution of para grass increased by some 300 ha in five years.

Contact: Penny Wurm, Tel: 08 8946 6355 <penny.wurm@cdu.edu.au>

Insect controls for mimosa

IN some good news at the conference however, *Mimosa pigra*, one of the worst weeds in northern Australia, is showing signs of slowing down. Dense, impenetrable infestations currently cover 800 km² of floodplains in the Northern Territory. Biocontrol measures have been trialled since 1979, with 14



Photo: Penny Wurm



A field of para grass (*Urochloa mutica*) in Kakadu National Park. The grass is displacing wild rice, a staple of magpie geese, pictured at left.

Photo of para grass: Peter Martin, Weeds CRC

insect species that feed exclusively on mimosa released. So far success has been mixed, but new results are showing the amount of mimosa seed in the soil in infested regions of the NT have shown massive declines. Soil seedbanks are now around 10% of what they were before biocontrol began, a sign that the insects are starting to make an impact.

Contact: Bronwyn Routley, Tel: (08) 8999 2266

Plant recovery from herbicides

HOW do plants recover generally from herbicides to control weeds? Researchers from CDU and the TS–CRC presented preliminary results from an investigation into the effects of glyphosate on tropical savanna woodland plant communities depending on the time of year it was applied. They found that spraying in both the late wet season and the early wet season negatively impact on cover of shrubs, geophytes and perennial grasses. In contrast, herbicides applied late in the wet season produced an increase in cover of annual plants while applications early in the season reduced annual cover.

Contact: Kristine Brooks, CDU, <kristine.brooks@cdu.edu.au>

Bellyache bush

BELLYACHE bush infests thousands of hectares of savanna lands right across northern Australia and new trials have been looking at how different grazing regimes affect the weed and how bellyache bush can affect pasture yield. Dr Faiz Bebawi, from the Tropical Weeds Research Centre at Charters Towers, presented findings that showed that the mortality of bellyache bush differed significantly between grazing regimes—and without pasture cover (including improved and native), the weed is likely to dominate areas much faster.

Contact: Faiz Bebawi <Faiz.Bebawi@nrm.qld.gov.au>

15th Australian Weeds Conference: <www.plevin.com.au/15AWC2006/>

When continents collide, minerals could boom

TWO BILLION years ago northern, western and central Australia all belonged to different continents. New research in Adelaide's School of Earth and Environmental Science, is showing how these continents may have come together—and the information could be significant to the discovery of new mineral deposits.

Kate Selway, a PhD student at the University of Adelaide, found evidence for a collision between northern and central

Australia which happened 1.64 billion years ago.

"If you looked south from Alice Springs before that time, you would have seen an ocean," Selway says. "The huge forces involved in this collision produced mountain ranges and actually helped create the crust of central Australia."

Using a geophysical technique called magnetotellurics, which measures the electrical conductivity of the Earth to depths of hundreds of kilometres,

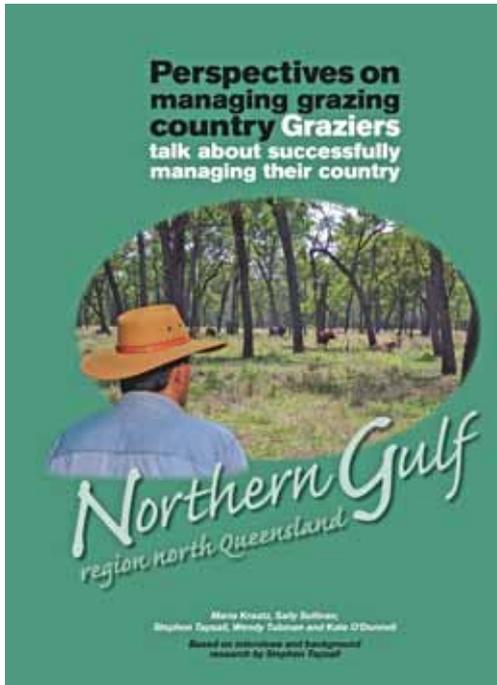
Selway has been probing the Earth beneath central Australia.

She found that northern Australia is more conductive than central Australia, and that the boundary between them extends to at least 150 km depth.

"This kind of information can be fundamental in finding the next big mineral deposit," she said.

More information: Kate Selway, Tel: (08) 8303 4971

E: <katherine.selway@adelaide.edu.au>



Northern graziers share their knowledge, wisdom

Perspectives on managing grazing country: graziers talk about successfully managing their country, is a set of four books produced by the Tropical Savannas CRC describing natural resource management as currently practiced by some successful graziers and pastoralists. Each book focuses on a region of northern Australia: the Cape River Catchment near Charters Towers, Queensland's northern Gulf, and the Northern Territory's Victoria River District and Sturt Plateau.

While there is much information available from scientists, agencies and community interest groups, it is harder to access local knowledge and conventional wisdom held by people who live and work on the land. These books redress this imbalance by documenting how graziers manage their natural resources, and recording the practice and wisdom accumulated by a selection of respected north Australian graziers.

The books arose out a project funded by Meat and Livestock Australia and the TS-CRC and led by Stephen Tapsall. Stephen collected many hours of interviews from dozens of graziers and pastoralists and much of the text is in their own words. This local knowledge is accompanied by summaries of issues faced by land managers written by Maria Kraatz, a writer and editor and Sally Sullivan, an experienced NT pastoralist.

Cost: \$15; see order form this issue, or order online:
<www.savanna.cdu.edu.au/publications>

Detecting cattle disease

THE Bovine Syndromic Surveillance System (BOSS) website features information on endemic and exotic cattle diseases. BOSS is a web-based decision support software program that allows cattle owners to investigate disease and parasites within their cattle herd. BOSS uses a veterinary database with information and symptoms of approximately 1000 diseases of cattle. BOSS requires cattle owners to enter some information or data into the website to help generate a tentative diagnosis. Go to: <www.ausvet.com.au/booss/>

Cape York tackles pests

FUNDED by the Natural Heritage Trust, CYPPEsts.Com is the new website of the Cape York Weeds and Feral Animals Program (CYWAFAP). The program aims to facilitate pest management plans, strategies, training and advice in the Cape York Peninsula. Users can check threat maps and images, access reports and strategies, and discover training and other services. <www.cyppests.com/>

Degradation and recovery

Pasture Degradation and Recovery in Australia's Rangelands: Learning from History details eight historical episodes of degradation in Australia's rangelands and aims to provide reference material for grazing land management and its environmental consequences. The eight episodes represent a failure to manage for the extreme climate variability of Australia's rangelands. The

report then analyses these episodes in terms of the impact from a grazing-use perspective.

Queensland Dept. Natural Resources and Water, ISBN: 1 920920 55 2

World maps

WORLDMAPPER is a collection of world maps, where territories are defined according to the subject of interest. The maps presented are cartograms which re-size each country (or other geographical unit) according to some other variable. For example, if population is the variable, a country such as the UK will appear much larger than it does

on a standard map, and sparsely populated countries will appear smaller.

<worldmapper.org/>

PrimeNotes

A REMINDER that the 2006 version of PrimeNotes is available from the Queensland Department of Primary Industries & Fisheries. They can be used for a wide variety of Australian conditions and situations, and focuses on targeted, quality-assured information and advice to help rural business, natural resource management and rural communities.

Online: <www.publications.qld.gov.au>
Tel: 1800 816 541 (local call)

Web-based mapping of NT info

THE Tropical Savannas CRC, Northern Territory Department of Natural Resources, the Environment and the Arts, the Northern Land Council and Ecobyte Systems have been awarded a two-year contract from the Natural Heritage Trust to develop a website that displays maps of biodiversity, weeds and feral data in the Northern Territory and that provides tools for land managers to help them manage biodiversity, weeds and ferals. These maps may show locations where animals and plants have been trapped or sighted and distributions of plants and animals, including those of weeds and pest animals.

Currently most of this data is held in various Northern Territory Government databases. The project will collate these varied data sets and store them in a form suitable for displaying on a website—primarily as maps as they provide one of the most effective means of making NRM information more useful to managers and planners.

The website will also have a suite of tools for data managers to make it more responsive to users' needs and links to other information to make the maps useful to a range of users. These users include land managers, Landcare and NHT groups, local and territory government, and researchers. It is envisaged that website will also prove useful to managers and planners in Queensland and Western Australia.

Contact Peter Jacklyn, Tel: (08) 8946 6285 <peter.jacklyn@cdu.edu.au>
<www.savanna.cdu.edu.au/information/infonet_project.html>

Rangeland management and protection

A NEW series of guides, *Managing for Biodiversity in the Rangelands*, aims to assist in better management of Australia's vast rangelands. The guides cover management of fire, weeds, total grazing pressure as well as tools for assessing financial and environmental impacts and guidelines for sustainability. The TS-CRC helped prepare the fire and grazing management guides.

Fire management in the rangelands

This report provides information to improve the ability of rangeland managers to plan and implement fire management strategies relevant to vegetation types.

Managing total grazing pressure

Focusing on grazing land management zones (GLMZs) as being representative of regions with similar total grazing pressure and biodiversity characteristics, these reports provide guidelines to assist in the management of total grazing pressure, particularly in relation to impacts on biodiversity.

Financial and environmental impacts

This guide describes a framework that land managers can use to help them decide how to balance environmental and economic considerations. It helps land managers assess production, economic and environmental impacts, and how they might trade off these impacts, to make better and more informed decisions about their management options.

Weed management

The report identifies the threats to the biodiversity of the Australian rangelands from weeds, as well as the weed management techniques that would be most effective given diverse tenures and land uses in extensive rangelands. Further guides about feral animals, water management and biodiversity monitoring will be prepared and published in the future.

Go to: <www.deh.gov.au/about/publications/index.html>

Go to Biodiversity, then Books and Reports, then *Managing for Biodiversity in the Rangelands* (listed alphabetically).



Photo: Alaric Fisher

Monitoring changes

There are also a series of reports detailing changes in the rangelands in four representative regions. *Tracking Changes in the Victoria River District (VRD) Pastoral District* was commissioned by the Australian Collaborative Rangeland Information System (ACRIS) and the Northern Territory Government. The VRD is one of four pilot districts used to monitor changes in Australia's rangelands. The others were the Darling Riverine Plains, Gascoyne-Murchison in Western Australia, Desert Uplands in Queensland and Gawler in South Australia. Reports are now available for all districts.

In northern Australia, native grassland species were maintained in a series of good seasons, but there were signs of increasing exotics, mainly buffel grass, in the * Desert Uplands and a significant thickening of woody species in the VRD.

Summary: <www.deh.gov.au/land/publications/acris/brochure.html>

VRD: <www.deh.gov.au/land/publications/acris/nt.html>

Hard copies: Dept Environment and Heritage

GPO Box 787 Canberra ACT 2601

Tel: (02) 6274 1111 Fax: (02) 6274 2360

Sustainable production

THE NT Department of Primary Industry, Fisheries & Mines website's section on pastoral production provides useful contacts as well as information on soils, fertilisers, species and cultivars, stocking rates, grazing management, and pasture seed production and storage.

<www.nt.gov.au/dpifm/Primary_Industry/>

Determining waterpoints

ORIGINALLY developed for Kimberley and Pilbara stations, the *Pastoral Waterpoint Workbook* by Troy Sinclair and Francis Bright, is a reference and decision-support tool to assist in making decisions about watering cattle.

It discusses the costs of providing stockwater and investing in new waterpoints as well as considerations when planning new points.

Producers in other tropical regions may find the workbook useful for bet-

ter understanding the cost of supplying waterpoints.

Cost: \$20, Dept Agriculture WA (Kununurra) Tel: (08) 9166 4000

Mammal extinction debate

Australia's Mammal Extinctions—A 50,000-Year History, chronicles Australia's mammal extinctions—more than 65 mammal species vanishing in the last 50,000 years. Chris Johnson, Professor in Tropical Ecology and Conservation at James Cook University, provides a detective-like tour of the mammal extinction record, uncovering how, why and when they occurred.

Cambridge University Press, ISBN: 0521686601 AUD\$49.95 316 pp.

<www.cambridge.org/aus/catalogue/promotion.asp?nav=view&code=EISep06>

Plant harvest opportunities

THE report, *Small-scale Commercial Plant Harvests by Indigenous Com-*

munities, details work with Indigenous communities in the Northern Territory to explore the feasibility of small-scale enterprises based on harvesting plant material in remote Aboriginal communities. Authors Julian Gorman (CDU) and Peter Whitehead (TS-CRC) identify potential plant products using botanical advice in consultation with Indigenous communities. Case studies look at bushfoods, sale of customary foods, live plant trade, arts and craft, and novelties and educational items.

Go to: <www.rirdc.gov.au/reports/AFT/04-148.pdf>

Purnululu publication

A free 12-page publication promoting the World Heritage-listed Purnululu National Park in the Kimberley includes a guide to the walk trails, gorges and visitor facilities throughout the park. Available from DEC offices and visitor centres throughout the Kimberley.

December

Northern Australian Water Use Experts Summit—Strategies and Solutions December 1 and 2, 2006

Venue: Parliament House, Darwin

The two-day Summit will focus on formulating strategies for water-use priorities.

Contact: Merrilyn Wasson

Email: <merrilyn.wasson@cdu.edu.au>

Web: <www.cdu.edu.au/ser/Events.html>

2007 January

Third International Conference on Environmental, Cultural, Economic and Social Sustainability 4–7 January, Chennai, India

Venue: University of Madras, Chennai, India.

The conference will work in a multi-disciplinary way across the various fields and perspectives through which we can address fundamental and related questions. Main speakers include some of the leading thinkers in these areas, as well as numerous paper, colloquium and workshop presentations.

Postal: PO Box K481, Haymarket, NSW 2000

Tel: (02) 9519 0303 **Fax:** (02) 9519 2203

E: <info+S07@commongroundconferences.com>

Web: <www.SustainabilityConference.com>

April

XIIIth International Symposium on Biological Control of Weeds 22–27 April 2007, Montpellier, France

Venue: Palais des Congrès

The scope of this year's symposium includes all types of biological control of all weeds through the use of living organisms as biological control agents, including augmentative biocontrol (arthropods, mycoherbicides) and conservation of natural enemies.

Email: <Weeds2007@ars-ebcl.org>

W: <www.cilba.agropolis.fr/symposium2007.html>

July

3rd International Energy, Exergy & Environment Symposium (IEEEES-3) 1–5 July, 2007, Évora, Portugal

Contact: IEEEES-3 Conference Secretariat

Department of Physics, University of Evora

Rua Romão Ramalho 59 7000-671

Evora, Portugal

Fax: +351 266 745 394 **E:** <ieees3@uevora.pt>

Web: <www.eventos.uevora.pt/ieees/index.php>

World Environmental Education Congress 2007

2–6 July, 2007, Durban, South Africa

Venue: Durban International Convention Centre

Contact: Congress Secretariat: The Conference

Company, Nina Freyssen–Pretorius / Carol Corser

Tel: + 27 31–303 9852 **Fax:** + 27 31–303 9529

E: <nina@confco.co.za or carol@confco.co.za>

Web: <www.weec2007.com>

August

3rd Australia–New Zealand Climate Change and Business Conference 30–31 August, Brisbane, Qld

The conference will have a strong focus on adaptation and will provide more specific examples of new business opportunities and how business can manage the risks arising from climate change. It will explore the opportunities in other markets including Japan, China, India and other south-east Asian countries.

Contact: Elizabeth Edmonds,

Conference Organiser PO Box 375 Collaroy NSW 2907, **Mob:** 0413 439 573

Email: <e.edmonds@climateandbusiness.com>

Web: <www.climateandbusiness.com>

Savanna Links is edited and produced by the Tropical Savannas CRC. Articles can be used with permission. For story ideas or contributions, please contact us. Views expressed in *Savanna Links* are not necessarily those of the TS–CRC.

Head Office: Tropical Savannas CRC

Charles Darwin University

DARWIN NT 0909

Tel: (08) 8946 6834 **Fax:** (08) 8946 7107

Email: savanna@cdu.edu.au

Web: <savanna.cdu.edu.au>

Editors: Peter Jacklyn, Kate O'Donnell

Writers: Julie Crough, Frances Bancroft, Kate O'Donnell. Non-original material from a range of sources, including press releases.

Kate O'Donnell

<kate.odonnell@jcu.edu.au>

Tel: (07) 4781 5967 **Fax:** (07) 4781 5515

Tropical Savannas CRC, James Cook University Townsville Qld 4811

Julie Crough

<julie.crough@cdu.edu.au>

Tel: (08) 8946 6754 **Fax:** (08) 8946 7107

Tropical Savannas CRC, Charles Darwin University, Darwin NT 0909

Peter Jacklyn

<peter.jacklyn@cdu.edu.au>

Tel: (08) 8946 6285 **Fax:** (08) 8946 7107

Tropical Savannas CRC, Charles Darwin University, Darwin NT 0909

Front and back cover design

BoaB Interactive

<www.boabinteractive.com.au>

Printed by LogicMedia, JCU, Townsville

OUR STAKEHOLDERS



ABORIGINAL COMMUNITIES



PASTORALISM



TOURISM



CONSERVATION



DEFENCE



MINING

Read *Savanna Links* online at <savanna.cdu.edu.au/publications/savanna_links_all.html>