



# SAVANNA LINKS

Cooperative Research Centre for the Sustainable Development of Tropical Savannas

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*This toad was measured at 16.5 cm; impressive, but lead cane toads that head a feral migration can measure more than 20 cm*

Photo: Greg Calvert

As the inexorable march of the cane toads draws closer to the Top End, Dennis Schulz asks if the animal will wreak havoc on the wetland systems of the Top End—and in particular Kakadu National Park

## The cane toad dialogues: disaster or disruption?

**W**ith cane toads on the threshold of Kakadu National Park and heading towards Darwin, scientific opinion remains divided over what impact the introduced and highly poisonous species will have on the Top End environment. While some experts forecast an ecological holocaust with a wide range of native species facing drastic declines, others are more sanguine.

“That’s scare-mongering,” charges NT Parks and Wildlife Commission director, Dr Bill Freeland. Having done over a decade’s research on cane toad impacts Dr Freeland says toads cause massive species declines when they first appear but the numbers of all affected species bounce back within a few seasons.

A just-completed preliminary assessment of the toad’s impact on Kakadu<sup>1</sup> is uncertain about the long-term effects, simply because so few studies have been done. A general lack of detailed ecological information on many of Kakadu’s animals adds to the uncertainty.

However, the report found that more than 150 predator species were potentially at risk, some such as the northern quoll at a very high risk because of its diminishing range.

When the toads do arrive, they will occupy almost all the habitats within Kakadu National Park, although saline regions and open water habitats were identified as being of less concern.

As Parks Australia staff at Kakadu National Park are currently gearing up for the onslaught that’s almost certain to take place this wet season, *Savanna Links* talked to the people who have already experienced the invasion. Pastoralists, Aborigines and other land managers from western Queensland and the Territory’s Gulf region can provide an insight as to how this toxic intruder will impact on the sensitive wetland ecology of the Top End.

Chris Holt was invaded twice. The owner/manager of Mainoru station in Arnhem Land is now in her second season of dealing with invading toads. A decade ago she and husband Malcolm owned Balbarini station, closer to the Gulf of Carpentaria, where they were attacked en masse. “They came by the road, not in the creeks like we had been told they would,” she recalled. “It was just disgusting. The road was like a moving carpet at night. It was if they sent in big shock troops because some of the ones at the front were as big

*continued page 2*

# Cane toads: disaster or disruption?



Photo: Greg Calvert

as bread and butter plates. They were huge.” Ms Holt remembers the initial effects were devastating. “We found lots of dead freshwater crocodiles in the shallow water holes in the river. We found dead goannas and had no snakes at all that year,” she recalled.

She said the tree frogs nearly disappeared, but by the end of the dry the toads had no more food and the Holts found themselves surrounded by dead cane toads. They assumed that by the next wet the size of the toads would be just as large, but they weren’t—instead they were quite small.

The Holt family, like many others caught in the westward march, watched as native species managed to survive. “The native animals seem to learn quite quickly that you can’t eat them,” explains Ms Holt. “In our experience they had no long-term effect on the wildlife whatsoever.”

That experience was duplicated on Mallapunyah Springs, where Louise Martin witnessed their arrival.

“When they came we found a lot less goannas and poisonous snakes

. . . (they) pretty much disappeared,” she remembers, “but the goannas have all come back. They got used to the toads.”

Many of those living in the Gulf region report how quickly predatory birds learned to adjust to the poison sacs the cane toads carry on their backs. “The crows and the kites have learned to live with them,” says Ms Martin. “They pick the cane toads up and turn them over and pick their guts out.”

Paul Zlotkowski, owner/manager of Wollongorang station, just inside the NT border, was introduced to the toads in dramatic fashion. “We couldn’t understand why all our chooks died,” recalled Zlotkowski. “We must have had 20 die the first night and the rest died the next night.

They drank the water where toads laid their eggs. Then the goannas and the green frogs disappeared and the snakes disappeared. Never saw one snake for years and years. But it’s all come back to normal now.”

Many of those canvassed who witnessed the initial invasion remarked on how large and formidable the lead toads were. “When they first came across they were a fair size but now they’re a lot smaller. Just about twice the size of the little green tree frogs,” observed Bill Olive, owner manager of Hell’s Gate Roadhouse in western Queensland. “They die off by the thousands when it gets really hot at the end of the dry season.”

While toads persist everywhere they travel, they are usually only seen during the night. “We have lights

around the motel at night and they line up in the light like Dad’s Army,” reported Olive. “They clean up the insects and bugs. You often wonder what we’d do if we didn’t have the toads to eat all the bugs.”

Kakadu, however, is not the only national park threatened by the advance of the toads. Nitmiluk National Park and its world-famous Katherine Gorge are also in their path; the Eva Valley community of Manayallaluk are already feeling the toad’s presence. Nick Dicandilo, advisor to the community reports that they have been sighted travelling by the hundreds at night on the gravel road just 10 kilometres from the settlement. They are already impacting on indigenous bush foods.

“There hasn’t been many frill-necked lizards this year and that’s a huge food source. So people are really concerned,” said Dicandilo.

While this anecdotal evidence for the survival of native fauna may seem reassuring, it is unlikely it takes into account many of the Australian animals that are active at night. A positive outcome is by no means assured and, as the Kakadu report notes, cane toad control options are extremely limited and broad-scale control not possible at this stage.

1. van Dam, R.A., Walden D., Begg G., (2000), *A preliminary risk assessment of cane toads in Kakadu National Park*, Final Report to Parks North, Supervising Scientist, Darwin, NT., 89pp.

For more information go to our Savanna Information Section, feral animals. <http://savanna.ntu.edu.au/>

## Tropical Savannas CRC: Linking the North

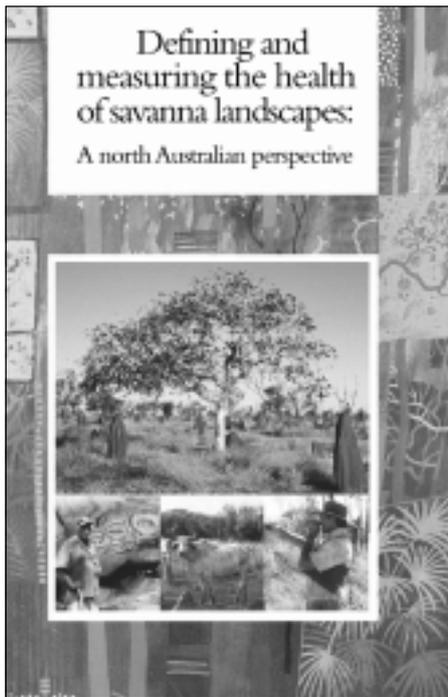
The Tropical Savannas CRC is a joint venture of the major organisations involved in land management of the savannas of north Australia. It comprises two universities, three divisions of CSIRO, four NT, three Queensland, two WA government agencies and one federal agency. The Centre promotes sustainable use and conservation of Australia’s tropical savannas by acting as a bridge

between agencies engaged in land-management research and industries representing land users: e.g. pastoralists, Aboriginal groups, the tourist industry and conservation managers; and by looking for ways to ensure more research ends up being used on the land. Director: Mr John Childs  
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## Information unit set up for EPBC Act

AN Environment Protection and Biodiversity Conservation Unit has been set up following the introduction of the new national environmental EPBC Act. Run by the World Wide Fund for Nature (Australia) and the Humane Society International the unit aims to promote knowledge and understanding of the Act in the community and to facilitate community involvement in its implementation. A range of fact sheets are available on topics in relation to the Act, such as threatened species and communities and environmental impact assessment. There is also an email listserv that sends out regular updates of EPBC-related developments.

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For information, including cost and ordering, on any of these publications, contact:  
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## New publications from the TS-CRC

LANDSCAPE health, weed management in the Top End, proceedings on a land management forum and a study on pastoralist learning are the new publications on offer from the TS-CRC. You can read about the report on pastoralist learning, *More than can be said: A study of how pastoralists learn*, on pp. 8–9 of this issue.

The free discussion paper, *Defining and Measuring the Health of Savanna Landscapes*, defines healthy country in a way that takes account of landscape function and biodiversity as well as the needs of people.

This new way of looking at landscapes aims to involve the whole range of savanna land users in managing for healthy country. For an introduction to landscape health, see *Savanna Links*, Issue 12, pp. 1–2.

*Land Administration and Land Management in the Tropical Savannas: A Better Way* is the proceedings of a TS-CRC workshop held earlier in 2000. The workshop brought together a range of man-

agers, planners and researchers to discuss land administration policy across the north and its attendant issues. Contributors to the proceedings include Emeritus Professor John Holmes; pastoralist Roger Landsberg; researcher Peter Whitehead; and tour operator Rick Murray. For a summary of some of the issues covered in the forum see *Savanna Links*, Issue 13, pp. 4–8.

*Not from here: Plant invasions on Aboriginal land of the Top End* is a report by Nick Smith on the weed-management issues faced by Aboriginal communities in the Top End of the Northern Territory.

One of the main findings of the report was that there is an urgent need to build weed-management capacity in local communities. The report is the outcome of the TS-CRC project coordinated by Michael Storrs from the Northern Land Council's Caring for Country Unit. Nick Smith was supported by NTU's Centre for Indigenous Natural and Cultural Resource Management.

## Biodiversity impact a hot fire research issue

THE effects of fire regimes on biodiversity is one of the most important fire research issues for land users across northern Australia, according to a recent CSIRO survey. CSIRO Sustainable Ecosystems conducted the survey to help identify priority needs for fire research among stakeholders that included park management, Bushfires Council NT, pastoralists, and conservation, tourism, research and Aboriginal interests. The survey's response rate of 73 per cent reflected the keen interest in fire management across all sectors.

CSIRO and other research partners in northern Australia are planning new projects on fire to support nature conservation. The projects may become part of the CRC research program. CSIRO surveyed 180 people from the Top End, north Queensland and the Kimberley. The questionnaire identified the following potential areas of research, and respondents were asked to rank them from 1 (least important) to 7 (most important).

- Fuel loads, fire intensity, and other fire behaviour
- Methods of fire control
- Fire mapping
- Effects of fire regimes on biodiversity
- Effects of fire regimes on Greenhouse gases and carbon storage
- Burning practices to achieve desired fire regimes
- Traditional Aboriginal burning practices

After fire and biodiversity, the next most important issues were generally considered to be burning practices to achieve desired fire regimes, followed by fuel loads,

fire intensity and other aspects of fire behaviour.

There was substantial variation among stakeholder groups in priorities. For example, compared with other stakeholders, such as fire managers and pastoralists, rated fuel loads, fire intensity and other aspects of fire behaviour and control higher, and effects of fire regimes on biodiversity lower.

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### A tropical topics bonus

In this issue of *Savanna Links* you will find an extra publication: *Tropical Topics*, an interpretive newsletter published for the tourism industry by the Queensland Environmental Protection Agency. Already well known for its informative nature-based newsletters about the Great Barrier Reef and the Wet Tropics, *Tropical Topics* will now bring their great story skills to the dry tropics.

The Tropical Savannas CRC is happy to be able to part fund this newsletter, and we hope you enjoy it. It is envisaged we will bring you *Tropical Topics* twice this year. This first issue features northern Australia's distinctive termites and mounds.

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# Stories of learning and change in northern Australia's pastoral industry

In 1998–99 a group of TS–CRC researchers went out and talked to 18 pastoralists from northern Australia to discover how they went about making changes on their properties. They were interested in understanding how pastoralists learned, and how this in turn could best help extension workers and educators support pastoralists. The stories they collected included new ways of mustering, fencing, product diversification and using the Internet.

By Allan Arnott

The study was interested in what is known as 'informal' learning practices, as opposed to the formal setting of universities, schools or colleges. Most informal learning occurs in the workplace and without our necessarily being aware that we are learning. The pastoralists and their families who took part were from the north and west Kimberley in Western Australia, the Georgetown area in Queensland, and the Sturt Plateau in the Northern Territory. All the stories reveal much common sense and wisdom—and a highly individual approach.

## Key findings

### Learning processes in the pastoral industry tended to be *ad hoc*, unordered and highly individual

For pastoralists, informal learning and the gathering of information was generally from many sources and, at times, opportunistic. It was connected to immediate needs and took place in 'real time' as they went about their day-to-day work.

### Informal learning is an individual process and is perceived as common-sense knowledge that is rarely questioned or reflected upon by the individual

Informal learning processes (like seeking information from friends or groups, trialling the information and knowledge we have, etc.) are different for each individual. The person makes decisions about what they should do, what information they need to gather and where the information might come from.

Their informal learning processes were heavily based on personal contact and interaction—such as networking, using informal mentors

and group situations. These actions and interactions become common-sense actions and, as individuals, we do not generally think about how well they work.

### Knowledge is seen to be legitimate when it has been experienced or trialled by the individual person

The people in the study felt that knowledge (as against information) was only valid when they discovered it for themselves. That is, it is only when they have seen or experienced the event on (or near) their own property that they are convinced of its validity. In a number of examples pastoralists were engaging in trial and error learning. A pastoralist in Western Australia who experimented with watermelons is one such example. Over a period of time he planted his crop and then continued to seek information, develop better watering and fertiliser arrangements and generally sought answers to problems as they arose.

### Implications for practice

It was apparent that people saw their pastoral operations as different from anyone else's. Information and learning, to become legitimate, had to be trialled and validated in their own workplace.

There is a perception shared by pastoralists', concerning education

and learning, that to be knowledgeable or 'smart' requires formal education qualifications. This view may mask the value of informal learning, and also limit teaching of informal learning. For example, if we meet a barrier in our learning we may not be able to describe or overcome that barrier.

### Individual pastoralists perceive and prioritise problems differently

For example, the act of providing information on a broad scale through television or radio sources does not necessarily mean that such information will be accepted.

For example, is the source of the information credible? Is it personalised? Is it relevant? Is it timely? Has the information been worked through the informal-learning systems that pastoralists see to be the most legitimate?

Large-scale media campaigns, if we take the pastoralists from the study as an example, may not be an effective means of providing information to the pastoralist industry. Similarly, 'top-down' programs (those devised and decided on by governments or their agencies, for example) may not be effective. As the study indicated, pastoralists are very aware of their local contexts and see them as different to those that occur elsewhere.

A report on the project, *More than can be said: A study of how pastoralists learn*, will be available from the TS–CRC early in 2001. It includes all the interviews and stories collected from pastoralists who participated in the study. Two shorter publications based on the study, one which makes a number of recommendations for extension workers and educators, are available from the TS–CRC. See contact details at end of article.



## Supporting informal learning: lessons for extension and research

The points made below were selected as those which could (or do) impact on the effectiveness of educators and other service providers who work with pastoralists. They may already be in use.

### Becoming or using an 'esteemed source'

The pastoralists in the study tended to network with or seek most of their information and advice from 'esteemed sources'. In other words, those people who had either become known personally to them or were well known by a wider group of pastoralists. They also used highly regarded technical information sources such as specific newspapers, journals, radio programs, and so on. It was apparent throughout the study that they relied heavily on esteemed sources for their information and advice.

### Establishing contact and developing, where feasible, one-to-one relationships

In line with the comments above regarding esteemed sources, people preferred to deal with individuals on a one-to-one basis. This was certainly the case with extension officers. They realised that while this was not always possible, it was preferred. Such an approach allowed them to ascertain the 'worth' of the person (and their advice and information) and develop a relationship with them. Through such a process it is also easier to access information by raising the subject during conversation and social interaction.

### Relating concepts and ideas to practical examples on pastoralists' properties

People would prefer the learning activity to occur on their property. This could be either some trial and error activity or a particular scientific or other trial. Trials seen on nearby properties or on field days were of interest. In both these cases we are referring to practical on-site demonstrations of a product or new idea.

In terms of formal education, the content of courses should be linked to practical situations. Asking pastoralists (as students) to carry out activities related to their properties is an obvious way to support learning.

Action learning and evaluation approaches, where practice is reflected upon, ideas developed and then trialed, would seem appropriate. Such approaches may also contribute to honing pastoralists' informal learning skills.

### Accessing groups to encourage and facilitate informal learning processes

All of the people interviewed in this study were actively involved in small producer groups in their district. These groups included Landcare, Bushfire Council, Land Conservation District Committees (LCDC), pest and catchment management groups, as well as shire councils. While informal learning is very individualistic, small groups provide many opportunities for informal and incidental learning to occur.

Meeting in informal, small group settings can enable pastoralists to access information and knowledge from esteemed sources, test out ideas, and gain support and encouragement for their own projects. The groups also provide a forum to talk about successes, failures, and problems. There is little doubt that group situations, either formal or informal, can potentially provide quite powerful learning opportunities.

### Highlighting informal learning processes and practices within a range of formal education and other programs

It was apparent from the study that people engage in formal education courses when they feel that there is a need to gain in-depth information in an area of interest. For example, tourism and local ecology were two areas spoken about in the study. In such situations pastoralists were concerned that there was little follow-up after the completion of the course. Establishing network groups can both support learning and assist course participants to 'learn how to learn'. Most of the pastoralists returning to study can be termed mature-age learners (in regards to formal education settings). As such, they may need to be re-acquainted with this new setting. Both small, informal group settings and the use of relevant practice-based examples would appear useful learning approaches.

### Assisting and supporting pastoralists to access and manage information easily

Pastoralists have a mass of information coming at them in various forms, almost continuously. The problem is, much information is provided at a time when it is neither applicable, nor a priority. In other words the timing means that the information is not useful. Some information sources such as the Internet could be a particularly accessible information source available at any time. However, the Internet is not being used anywhere near its potential.

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## Introduced grasses: poor master but useful servant



Workshops on controlling improved pastures are being held in the NT and Queensland. Nearly 100 people from conservation and land-management agencies, the pastoral industry, landcare groups, fire authorities, and traditional owners attended such a workshop in Darwin in November 2000.

There are many environmental problems with introduced grasses in northern Australia; altered fire regimes which in turn damage our native vegetation is just one of them. However, improved pastures are an important part of cattle production for many markets. Agricultural consultant *Trevor Howard* looks at some strategies the grazing industry and government are implementing to help contain exotics while reaping the benefits.

A past issue of *Savanna Links* highlighted the problems associated with introduced pasture grasses in northern Australia<sup>1,2</sup>. The author, David Bowman, portrayed the introduction of gamba grass *Andropogon gayanus* as an evolutionary experiment that pits northern Australian savanna ecosystems against an extremely fire-tolerant African grass.

There is no doubt that gamba grass is a major fire problem in unmanaged situations as it contributes to fuel loads far in excess of native grasses and cures much later in the dry season. There is now ample evidence of native vegetation being severely degraded by fires fuelled by gamba grass to warrant serious concern.

### Exotics versus natives

The problem is not confined to gamba grass. Para grass *Brachiaria mutica* also alters fire regimes on Northern Territory floodplains and wetter areas, and buffel grass *Cenchrus ciliaris* has similar effects in more arid areas. Elsewhere in the wet tropics of northern Australia guinea grass *Panicum maximum* is a species which has deleterious impacts on fire regimes and native vegetation<sup>3,4</sup>. Even Tully *Brachiaria humidicola*, a successful and popular grass for pasture and hay that grows in a low dense sward, burns with considerable intensity when cured. The gamba grass issue is part of a much bigger debate about the introduction of exotic grasses for cattle production.

While native pastures will remain the dominant component of the north's grazing systems, there are limits

in using native pastures for beef production across the high-rainfall monsoonal areas of northern Australia. Despite moderate growth during the annual wet season perennial grasses become dormant during the dry season and annuals die after setting seed. While native grasses may be well adapted to the seasonal cycle, the growth of cattle in these conditions follows a saw-tooth pattern with weight gains punctuated by periods of weight loss. Animals may require several seasons to achieve market weight but the resulting carcass may not be suitable for quality beef or high returns. To some extent, improved pastures are also limited by these cycles, but on the whole they tend to be more productive, resulting in a more consistent growth path for cattle, a younger turn-off and a higher quality carcass.

### Beef standards tighten

The advantages of improved pastures are being keenly felt now that beef markets are becoming more competitive and animal specifications are tightening. Under the domestic Meat Standards Australia tenderness guarantee scheme the growth path of cattle is an important factor in the acceptance process which excludes older animals raised on an erratic plane of nutrition. For live export cattle, age and weight requirements are specified and premium prices are paid for young animals suitable for optimum performance in the Asian feedlot industry.

In this context, improved perennial pastures have advantages as they offer higher energy, digestibility and protein levels as well as a capacity to carry more stock during the growing season and beyond. Many, such as

gamba grass, use moisture efficiently and remain palatable and productive for longer into the dry season than their native counterparts. An important attribute of some of these grasses is their resilience under grazing pressure and their contribution to erosion control. Improved pastures are now an important part of cattle production for many markets. Where improved pastures are sown, sound management practices to prevent off-site environmental and fire control problems are essential.

With quality assurance schemes such as Cattlecare now integral to many production and marketing pathways it is only a matter of time until whole property management becomes a focal point for some markets.

## Codes of practice

Industry is certainly recognizing and responding positively to the signs. Ongoing concerns about the potential weediness of the valuable forage legume *Leucaena leucocephala* have prompted commercial growers in Queensland to develop an industry Code of Practice<sup>5</sup>. The Code of Practice provides management guidelines for producers who wish to plant leucaena or reduce the likelihood of problems with existing plantings.

Gamba grass offers similar opportunities for a Code of Practice. There is no doubt that gamba grass can be managed in a pastoral situation, although it is no longer recommended by government in the Northern Territory<sup>6</sup>. At a recent gamba grass control workshop in the Northern Territory, Jeff Little, manager of Opium Creek Station, pointed out that although it is twice as difficult as other improved pastures to manage, it can be done successfully.

## Weeds or pastures?

While many people argue for the declaration of gamba grass as a noxious weed, followed by a big-stick approach from government, this will not remove the issues, infestations or plantings. Perhaps in areas such as the rural residential hinterland of Darwin the use of legislation could have some merit. But any blanket declaration would be unrealistic given the cost of enforcement and the fact that large-scale plantings are still used on many pastoral properties.

Ongoing debates about whether gamba grass is a weed or a pasture are meaningless and unproductive. Gamba grass can be both, depending on the context in which it occurs and the perspective of the individual. We now know that gamba grass can be effectively controlled with glyphosate<sup>7</sup> and that seed viability declines to a minimum over 12 months so that control efforts can be very rewarding<sup>8</sup>. What is needed is a process that engages everyone including pastoralists and conservationists, which promotes best practice in animal production enterprises as well as control programs, and which communicates the success stories from both pastoral and conservation perspectives.

Considerable progress has already been made in this regard. Some recent workshops in both the Northern Territory and Queensland have attracted participants from all sides of the fence and have exchanged information of value to all. In November, 2000, a workshop near Darwin was attended by nearly 100 people from conservation and land management agencies, the pastoral industry, landcare

groups, fire authorities, horticulturists, small rural block owners and traditional owners. Effective control techniques were demonstrated and the results of successful control programs were presented.

Land managers are very interested in understanding how to manage and control these new grasses. Learning to live with existing introduced grasses appears to be the most realistic option.

## Accreditation framework

The ISO 14000 accreditation framework, which is concerned with the local and regional environmental impacts of production systems and the policies and practices of an organisation, may well be the yardstick by which future producer performance is measured in discriminating markets.

The use of pasture species that improve animal production but contribute to the degradation of natural resources may limit domestic processing options or may jeopardise Australia's position in overseas markets unless sound management practices are demonstrated. Meat and Livestock Australia is about to fund a pilot study to explore the potential for developing an Environmental Management System for the beef industry based on ISO 14000 standards<sup>9</sup>. Another proposal is being developed to establish environmental codes of practice for the northern beef industry<sup>10</sup>. Obviously this will not happen overnight to resolve current problems and issues, but if current trends continue there will be a major shift in beef production and marketing over the next few years.

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# Pet reptiles help fund wildlife research

A pair of Northern Territory University researchers have secured the first license to hatch and market small reptiles such as bearded dragons, turtles and goannas to the expanding Australian pet market.

Tony O'Grady and Gavin Bedford have adapted the Northern Territory Government's doctrine of the sustainable use of wildlife, ensuring that the landowners are paid for each animal originating from their properties. Profits from the sales are used to fund ongoing wildlife research, and so avoiding the vagaries of government funding for science.

The researchers named their new business 'Woma' after the central Australian python. Bedford was strongly influenced by a speech he heard four years ago at Sydney University where the audience was told there was a strong chance that 60 per cent of the reptiles that Bedford and O'Grady want to study would be extinct or in serious decline before the government was prepared to fund research on them. It was a prospect that sparked a successful application to the NT's Parks and Wildlife Commission for a license to capture or hatch designated native reptiles and resulted in the advent of Woma.

Under the Woma system few reptiles are actually taken from the wild. The researchers trap the reptiles and identify pregnant females. The females are then given a hormone injection to stimulate egg laying. They take the clutch of eggs and are tagged so if they're captured again, they can trace the animal's movements.

"We're trying not to take adults and only very common varieties," said Bedford. "They have between three and five clutches of eggs a year and we only take one clutch from each female. If the eggs are fertile, we'll hatch 99 per cent of them." According to PWCNT, taking only single clutches of eggs has a minimal effect on the environment.

Landowners are an essential part of the sustainable use program and are already enthusiastic backers of Woma. Because they are paid for each animal or egg taken from the property, pastoralists now see reptiles as a resource. "The landowners start to recognise an economic value for the wildlife that's on their properties," said O'Grady. "Hopefully that will be an incentive so they'll incorporate that wildlife habitat into their management plans. They'll be looking after the whole habitat rather than concerning themselves only with the cattle side."

The animals are wholesaled to pet retailers operating in Victoria, New South Wales and South Australia, with restrictions on sales still existing in other states. The



*Sustainable wildlife sales: Above: Gavin Bedford, left, and Tony O'Grady check out a potential pet*



*Photos: Dennis Schulz*

Federal Government continues to restrict the export of Australian native species to overseas markets. The reptile sector is the fastest growing section of the pet industry and

Woma sees urban animal lovers as their target market.

"Our lizards make great pets for city kids who can't own a cat or a dog because of their lack of space," says Bedford. "They're easily cared for and housed in aquarium style setups." Animals of this exotic nature cost anywhere from \$50 for a bearded dragon to \$4000 a breeding pair for small goannas.

Woma's next growth phase will take on an unlikely tourism component. In an effort to explore larger areas and cover increasing costs, (where petrol is often \$1.40 a litre) they will invite paying research assistants to join them. Woma hopes to initiate, over the next 18 months, a program that runs like Earth Watch where people will pay for the privilege of working with the researchers trapping and marking reptiles across central Australia, in an effort to piece together their ecology.

Profits are already going back into research for tropical wildlife management. Woma has just sponsored its first research scholarship at NT University's Key Centre for Tropical Wildlife Management for a student to study the ecology of the spotted tree monitor. "We're already finding out a lot of information that's never before been known," says O'Grady. "We're trying to feed that information back to people who are in a position to do the research. And we're already achieving the goals set down by the strategy for sustainable use of wildlife." — Dennis Schulz

Contact Woma Research  
PO Box U311, Northern Territory University  
Casuarina NT 0815 Web: [womaresearch@womaresearch.com.au](mailto:womaresearch@womaresearch.com.au)

Key Centre for Tropical Wildlife Management  
Northern Territory University  
Tel: 08 8946 6413 Fax: 08 8946 7088  
Email: [wildlife@ntu.edu.au](mailto:wildlife@ntu.edu.au)  
Web: [www.wildlife.ntu.edu.au/](http://www.wildlife.ntu.edu.au/)

# Feral challenge for Arnhem community

The Arafura swamp in north central Arnhem Land is a vast wetland in near pristine condition of some 600,000 hectares. It is the largest freshwater ecosystem in eastern Arnhem Land and contains important breeding grounds for many species of bird, reptile and fish. The area has profound religious significance not only for local Aboriginal people but for communities right across eastern Arnhem Land, and is an important place for fishing, hunting and gathering.

However, the ecological balance of the swamp is now under threat by growing numbers of feral pigs (*Sus scrofa*). Feral pigs are a recent phenomenon in the Arafura Swamp, and have increased steadily over the past decade. As such, they represent a new management issue for local Aboriginal land managers.

TS-CRC PhD student Anthea Dee has carried out an extensive study into the habits of pigs in the Arafura swamp, recording information such as pig diggings, trampling, changes in vegetation cover as well as a suite of baseline data such as vegetation type, soil characteristics and distance to water.

She is also learning from local people's knowledge and perceptions of the pigs, thus gaining a more complete picture of the effects of the pigs on both the local community and the environment.

As Aboriginal people are acutely familiar with the natural landscape in which they live they are often an extraordinary source of knowledge about changes in the landscape on both a broad and micro level. She has also been assisted by the local Wanga Djakamirr rangers, who helped in selecting her study sites and shared their understanding of pig habitat and identification of tracks and scats.

The animal's most damaging behaviour is its digging; it ploughs up swampy habitats and river edges in the search for favoured foods. These areas then become more susceptible to erosion and weed invasion and waterways become muddied. The environment for other plants and animals, including aquatic plants and animals, are destroyed.

While Anthea still has most of her data analysis to complete, she says the pigs are having some very obvious impacts. "In over three years of visiting this area, the damage has multiplied beyond belief," she said. "So people are acutely aware of that, and the impact that it's having on their food."

Feral pigs are affecting the availability of some very sought-after bush tucker. Fresh water turtles and goannas, for example, are important food sources, but they are becoming increasingly hard to find. Says one local: "pigs cause problems for *djanda* (goanna) and turtle—we didn't get many goanna or turtle this year or last year because pigs ate them".



Photos: Anthea Dee

Above, Feral pigs shot by Wanga Djakamirr rangers near Gatji outstation. Left, feral pig damage between Gatji and Bundatharri

The Caring for Country Unit of the Northern Land Council has been facilitating a management planning process incorporating newly emerging threats such as feral animals and weeds, via programs such as the Wanga Djakamirr rangers who work out of Ramingining.

According to Michael Storrs, from the CFCU, work such as Anthea's is invaluable to the land-management planning process. "It will help us gain some understanding of Aboriginal people's perspectives on the feral animal issue," he explained. "It will also provide some data on what damage these animals are doing to local environments and perhaps give some options on how to strategically address the issue with regard to the local community's desires."

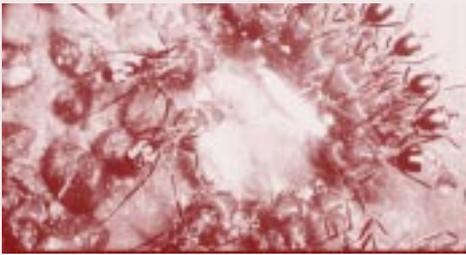
The poor condition of the water is also an issue. Local people complain that in the past when they went hunting they were able to drink the water, but now it's very muddied and full of pig excrement. While feral pigs themselves could also be seen as a food resource, most people are not deliberately going out and hunting pig. Many Aboriginal people believe that the meat can make them sick, and in fact, just don't like the taste.

In 2001 Anthea plans to complete the analysis of the survey data to see if a model emerges of variation in pig usage of various habitats. She will then give this information, along with the ethnographic record, back to the Aboriginal community in Ramingining so that it can be incorporated into a broad land management plan.

This will be developed in conjunction with the CFCU at the Northern Land Council. — Kathryn Thorburn

For more information contact: Anthea Dee  
Centre for Resource Environmental Studies  
Tel: 02 6249 4277 Fax: (02) 6249 0757  
Email: adee@cres.anu.edu.au

## Ants key to new sampling technique



CSIRO's Dr Alan Andersen has developed a technique for using ants as biological indicators of ecosystem health, which could have major benefits for natural resource management in Australia. The work is part of the TS-CRC's project on invertebrate biodiversity and bio-indicators. "Ants already have a proven track record as bio-indicators in the mining industry, and what we've done now is worked out a sampling technique that gives the same results as a comprehensive survey, but

takes just 10 per cent of the effort," said Dr Andersen.

The new technique requires far less specialist knowledge, so it's much simpler and cheaper than other methods. It can be readily used by a range of land managers, such as those in the pastoral and forestry industries. His work is based on

recent research at Mount Isa Mines in remote north-west Queensland, co-ordinated by the TS-CRC. The initial survey recorded 174 ant species and their patterns reflected what happened with plants and other animals. With the new technique, only 41 species were collected yet they told almost exactly the same story as the larger sample.

Contact: Alan Andersen, CSIRO Darwin  
Tel: (08) 8944 8431 Fax: (08) 8944 8444  
Email: alan.andersen@terc.csiro.au

### Rainfall patterns may change

Tiny pollutant particles in the atmosphere may be changing global rainfall patterns, say climate researchers, inducing a southward shift in tropical rainfall patterns, particularly over the Pacific Ocean. Dr Leon Rotstajn, from CSIRO Atmospheric Research, said if the shift is confirmed, it will have an impact on the Australian and Asian monsoon. "There may also be a reduction in rainfall over China and South-East Asia," he said. Atmospheric particles, known as aerosols, are produced by both human activities and natural sources. Main sources from human activity are fossil fuel combustion and burning of biomass.

Leon Rotstajn Tel: (03) 9239 4542  
Email: leon.rotstajn@dar.csiro.au

### Natural Resource Association

THE Australian Association of Natural Resource Management Inc. (AANRM) is calling for membership. The group is a network of individuals, government employees, researchers and Landcare groups with a common interest in natural resource manage-

ment. It provides an independent forum for debate on natural resource management, an opportunity to receive and contribute to a journals and newsletters, and workshops and training activities. Individuals, libraries, schools and Landcare groups pay an annual membership fee of \$63.80 (incl. GST). The fee for full-time students is \$52.80.

Contact Executive Officer, AANRM,  
PO Box 173, Lyneham, ACT 2602  
Tel/Fax: (02) 6247 4137  
Email: badenw@ozemail.com.au  
Web: www.soil-water.org.au

### Remote Sensing Industry

A REPORT by the Department of Industry, Science and Resources reveals considerable growth potential for the Remote Sensing segment of the local Spatial Information Industry. According to the report, *The Australian Remote Sensing Industry*, the global market for remotely sensed data and value added services is worth more than \$1 billion. The industry currently has revenues of around \$45 million with 24 per cent of total revenues coming from exports.

### Correction for Camel Co-grazing story in Savanna Bites

THE article in last issue's *Savanna Links* on the co-grazing of camels with cattle in Central Australia states that the project is run by RIRDC. In fact, the project was initiated and continues to be run by the Northern Territory Department of Primary Industry & Fisheries (Andrew Phillips). Funding is provided jointly by RIRDC and NTDFIP. Apologies for this error, and a thank-you to Jack Peart for pointing it out.

## Reading

### Grazing management

*Managing grazing in the semi-arid woodlands*, by Ian Partridge, is written in a readable question-and-answer style, and illustrated with many colour photographs. The booklet briefly describes the pasture types and the management options for sustainable production, which include setting stocking rates, moving stock and spelling, burning clearing or thinning trees, weed control and improving the grazing.

Contact DPI Book Distribution Centre  
PO Box 46, Brisbane, Qld, 4001  
Tel: (07) 3239 3772

### Land cover changes

*Land Cover Changes in Australia* is a report from the Bureau of Resource Sciences on the results of the collaborative BRS-state agencies project on the remote sensing of agricultural land cover change 1990/91-1995. The datasets developed for the project are now available on CD. The report and information about obtaining the datasets (available at 25m, 100m and 250m resolution) is at [www.brs.gov.au/land&water/landcov/allcc\\_report.html](http://www.brs.gov.au/land&water/landcov/allcc_report.html)

### Qld native vegetation

A new DNR publication, *Native Vegetation Management in Queensland: Background, Science and Values*, examines the role of native vegetation within ecosystems, in particular within agri-ecosystems. Issues covered include biodiversity, ecosystem services, habitat loss, fragmentation, soil loss, nutrient cycling, salinity, dieback, sustainable development, greenhouse, tree-grass interactions, and production factors. Cost is \$25 or \$19 for a CD-ROM version. Contact Nyree Retimana  
Tel: (07) 3896 9772

Email: ceespubs@dnr.qld.gov.au

### Dynamics of Change

*Land of Discontent: the Dynamics of Change in Rural and Regional Australia*, edited by Bill Pritchard and Phil McManus, discusses the decline of country towns, indigenous and environmental issues, health in rural areas, effects of financial deregulation and bank closures and the impact of technology. It explores why and how these changes came about, and what they will mean for rural Australia.

Cost is \$32.95 from UNSW Press,  
Tel: (02) 9664 0999

Email: info.press@unsw.com.au

## January

### 10th Australian Agronomy Conference Science and Technology:

#### Delivering Results for Agriculture?

28 January–1 February 2001, Tasmania

Venue: WrestPoint Casino Convention Centre, Hobart

Contact: Conference Design Pty Ltd

Tel: (03) 6224 3773 Fax: (03) 6224 3774

Email: mail@design.com.au

## February

### Outlook 2001: Capturing Growth opportunities

27 February–1 March, 2001, Canberra

Venue: The National Convention Centre, Canberra, ACT  
Outlook 2001 will be convened by ABARE, which is internationally renowned for the quality of its independent market and economic research. The conference provides an opportunity to focus on important issues to agricultural commodity sectors and for an interchange of views and ideas with senior industry and government representatives from across Australia and the world.

Contact: Tel: 1 800 806 591

Registration and catering: Yvonne Kingsley

Tel: 1 800 806 591 or (02) 6272 2265

Program speakers: Terry Sheales (02) 6272 2054

Trade exhibition: Phil Butler (02) 6272 2426

Web: [www.abareconomics.com/conferences/OL2001/index.htm](http://www.abareconomics.com/conferences/OL2001/index.htm)

## March

### Primary Industries Week

March 10–16, Queensland

Events and activities, profiling rural industries across Queensland.

### Productive Use and Rehabilitation of Saline

Lands, 7<sup>th</sup> National PURSL Conference

March 20–23 2001, Launceston, Tasmania

Theme: 'Wanted: Sustainable Futures for Saline Lands.'  
The objective of the Conference is to assess soil and water salinity in the context of integrated catchment management and to explore appropriate solutions for the sustainable use of affected lands. This conference brings together interested people from private industry, research, government and non-government agencies, with landowners and community groups.

Contact: Conference Secretariat: PO Box 342

Sandy Bay Tasmania 7006 Australia

Tel: (03) 6224 3773 Fax: (03) 6224 3774

Email: mail@cdesign.com.au

## April

### 19th Federal Convention

Water Odyssey 2001

1–5 April 2001, Canberra

Venue: National Convention Centre, Canberra

Themes: Sustainability of water resources; national water policy and management; water resources and allocation

Contact: Australian Water Association

Postal: PO Box 388

Artarmon, NSW 1570

Tel: (02) 9413 1288 Fax: (02) 9413 1047

Email: [info@awa.asn.au](mailto:info@awa.asn.au)

Web: [www.19fc.awa.asn.au](http://www.19fc.awa.asn.au)

## May

### 4th International Conference on Environmental Chemistry and Geochemistry in the Tropics

7–11 May 2001, Townsville

Venue: Jupiters Townsville Hotel and Casino

Theme: Geochemical Cycles of the Elements on Land and Sea in the Tropics: Implications for Global and Regional Change.

Purpose: The key objective of the conference series is to critically analyse successes and failures associated with environmental chemical and geochemical research in the tropics.

Also, the conference presents an excellent opportunity to share research results and applications in practice, to debate research theories and strategies, to network, and to stimulate needs-driven research and the development of technology. The following sessions are envisaged:

- Geochemistry of tropical river catchment processes: Flux to the ocean;
- Tropical soil geochemistry;
- Geochemical effects of metal and petroleum industries in the tropics;
- The impact of anthropogenic activities on coastal and marine environments;
- Sustainable farming and forestry systems to prevent environmental degradation in the tropics;
- Geochemical tracers of global change in the tropics  
Biogeochemical cycles in mangroves, salt pans, salt marshes and sabhkas of the tropics;
- Geochemical effects of fire in the tropics.

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Tel: (07) 4753 8555 Fax: (07) 4753 8600

Email: [andrew.noble@tv1.clw.csiro.au](mailto:andrew.noble@tv1.clw.csiro.au)

Web: [www.tv1.clw.csiro.au/geotrop2001/](http://www.tv1.clw.csiro.au/geotrop2001/)

## June

### Groundwater Quality 2001

18–21 June 2001, Sheffield, UK

This research-based international conference addresses the newest understanding of natural and enhanced restoration regarding pollutants in groundwater and soils.

Contact: The Secretariat

Email: [gq2001@sheffield.ac.uk](mailto:gq2001@sheffield.ac.uk)

Web: [www.shef.ac.uk](http://www.shef.ac.uk)

## July

### Geospatial Information and Agriculture Conference

17–19 July 2001, Sydney

**Venue:** Australian Technology Park, Eveleigh, Sydney.

This conference aims to provide leading-edge reports on the improvement of agricultural and associated land management decisions that result from using information delivered by geospatial technologies. Geospatial information can assist in:

- precision agriculture,
- remote sensing and geographic information systems (GIS),
- finding the best location for new enterprises,
- predicting potential threats from new pests and diseases.

A trade exhibition will also be held.

**Contact:** Conference Secretariat

GIA 2001 Conference Secretariat

GPO Box 128 Sydney NSW 2001

**Tel:** (02) 9262 2277 **Fax:** (02) 9262 2323

**Email:** gia2001@tourhosts.com.au

**Web:** www.giaconference.com

## September

### Recycled Organics 2001: Partnerships, Processes and Products

### 2nd National Recycled Organics Conference

25–27 September 2001, Gatton, Qld

**Venue:** University of Queensland, Gatton Campus.

Hosted by the Recycled Organics Consortium. Includes major trade expose from equipment suppliers, processing contractors, industry organizations, regulatory bodies, product developers and researchers.

Contact: Recycled Organics Consortium,

**Tel:** (07) 5460 1164 **Fax:** (07) 5460 1517,

**Email:** roc@recycledorganics.com.au

**Web:** www.recycledorganics.com.au

## Seminars

### 'Can Australian native plants be weeds?'

Presented by the Weeds Science Society of Victoria (WSSV), Thursday 22 February, 2001, Monash University, Melbourne. It will be followed by the example of *Pittosporum undulatum*, what can happen with the introduction of Western Australian plants to eastern Australia. The final presentation will be given by the renowned author of *Feral Future*, Tim Low. Cost: before 15/1/01: \$70 WSSV member, \$90 non-WSSV members. For registration after 15/1/00 add \$20 to prices.

**Contact:** Ros Shepherd, WSSV Secretary,

**Tel:** (03) 9576 2949 **Email:** secwssv@surf.net.au

### Tropical Ecosystems Research Centre

**Venue:** CSIRO Conference Room

McMillans Road, Darwin

**Time:** 3.45 pm, Fridays (monthly)

**Contact:** Barbara McKaige

**Tel:** (08) 8944 8411 **Fax:** (08) 8944 8444

**Email:** barbie.mckaige@terc.csiro.au

### Davies Laboratory Seminars

CSIRO, Townsville

**Venue:** Main Conference Room

**Time:** 11am, Fridays

**Contact:** John Gross

**Email:** John.Gross@tag.csiro.au

### Queensland Herbarium seminars, Brisbane

**Held on a monthly basis**

Toowong, Brisbane, Qld 4066.

**Contact:** Dr Rod Fensham

**Tel:** (07) 3896 9547 **Fax:** (07) 3896 9624

**Email:** rod.fensham@env.qld.gov.au

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