



TROPICAL SAVANNAS CRC

Cooperative Research Centre for Tropical Savannas Management

ANNUAL REPORT

2004–05



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

Mission: To achieve sustainable use and conservation of Australia's tropical savannas through excellence in collaborative research, communication and education.

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ISSN 1447-8579

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Centre objectives

The Centre will provide up-to-date and scientifically sound information to underpin management of the tropical savannas for sustainable use and for conservation. It will develop scientific principles and conceptual knowledge about the ecological, economic and social functioning of landscapes for the benefit of Australia's tropical savannas and the people who use them.

The Centre will tie its studies into the broad context defined by governments, stakeholders, land users and the community. In addition to its basic research, it will facilitate better management by conducting research, development and learning experiences in participation with tropical savanna stakeholders.

In particular, the Centre will produce:

- management options, along with assessments of their benefits and costs
- policy options, with analyses of their benefits and costs
- information packages and training in their use
- educational packages and access processes.

Achievement of the objectives will be focused through the following key result areas and their specific output targets.

1. Healthy landscapes—ecological, economic, and social

- indicators and attributes of health
- predictive models of landscape function and the impact of interventions.

2. Sustainable management systems

- landscape monitoring systems and associated management tools and packages
- management strategies for fire, grazing, tree clearing, restoration and decision support tools and packages
- environmental management systems and codes of practice.

3. Viable and socially desirable regions

- policy and management options for regional planning and development and associated guidelines and tools
- regional strategies for multiple land use, restructuring and reinvigoration.

4. Productive and capable people

- communication strategies and processes
- learning packages and education strategies
- knowledgeable and employable postgraduate researchers
- participating staff are more skilled and knowledgeable and able to work in multidisciplinary teams using participative processes.

Executive summary

Chief Executive Officer's Report

The year 2004–2005 was the midpoint in the current CRC's seven-year term, and will be marked with sorrow by all in the Tropical Savannas CRC community, with the death of one of our most respected and influential research leaders, Dr Jill Landsberg. As sad as the occasion was, the memorial service for Jill highlighted many of the personal attributes that made such a valuable contribution to the TS–CRC and to northern Australia. A great collaborator, outstanding scientist and skilled communicator, Jill was a passionate believer in good science making a real difference to the Australian rangelands, and to the lives and livelihoods of the people who live and work therein. In celebrating Jill's life and contributions, we were able to reflect on those characteristics and values that make a good CRC. Of course, the other important reminder is that CRCs are only as good as the people that go into the mix, and ours has been extremely fortunate in that regard.

At our CRC-wide planning and review meeting held in Darwin in September 2004, a number of important achievements were highlighted. The TS–CRC's independent review group, the Scientific Program Advisory Group (SPAG) highlighted the excellence in communication activities, impressive progress by NAILSMA and a range of important, stakeholder engagement initiatives. Directions for the Tropical Savannas CRC rebid were also discussed at the workshop, and there was a strong consensus for a CRC for Tropical Savannas Futures. The SPAG report noted:

“The current CRC is a good platform from which to launch a strong bid for renewal. It is also well positioned in relation to its high level of stakeholder support.”

One exciting development was the commencement of the NHT-funded marine turtle and dugong project, being conducted by the CRC in partnership with NAILSMA. This \$3.9 million project aims to assist coastal and island Indigenous communities, from Cape York and the Torres Strait, the Gulf, the Top End to the Kimberley to take a greater role in natural resource management, monitoring and research. The inclusion of this project in our portfolio, together with a number of other large, third party funded initiatives, has effectively doubled the size of the CRC's budget and operations compared to that two years ago.

A number of new information products were launched and produced during the year, reflecting the maturity of many of the CRC's projects. A suite of web based resources to assist fire managers across all sectors in northern Australia commenced development during the year, and the extremely successful North Australia Fire Information (NAFI) website moved from the trial phase to become fully operational during the second half of 2004. At the height of the fire season, stakeholders were downloading in excess of 3000 maps per day. The CRC launched another significant publication this year, entitled “Healthy Rangelands” based on principles for sustainable grazing land management. Other knowledge tools to assist with more sustainable use of pastoral lands are highlighted in the report, including the Beef Industry best practice in natural resource management project, and biodiversity conservation strategies on grazing lands. The key role played by the CRC in the roll-out of NHT2 across northern Australia was also highlighted in a number of project outcomes.

This year our activities and approach have been strongly endorsed by external critical review, and the external funding support for our programs has exceeded expectations by a large margin.

We are beginning to see examples of real impact of our research, innovation, communication and education activities, and we are growing. My congratulations and thanks to all members of the Tropical Savannas CRC Community.

Professor Gordon Duff, Chief Executive Officer

Chairman's Report

As I write this the death of Dr Jill Landsberg continues to remain in our thoughts. Jill was one of our research theme leaders who continued to try to work until her last weeks. She was an exceptionally talented scientist but we will miss her quiet, inquisitive, sensitive and perceptive presence as much as her contribution to the work and findings of the CRC. It wasn't until an event, held in Cairns, to celebrate her life that I learnt so much about how accomplished and individualistic Jill was. For example, I didn't know of her activities working with wildlife during her time in Canberra nor of her qualifications and the awards and recognition she amassed with her peers. Nor did I know of her experience in quite daunting mountain climbing and cave diving and exploration. I was reminded that the Board probably knows as little about the background of each of our dedicated scientists, researchers and staffs. CVs are soon forgotten. It is easily forgotten that such people try to make careers in a climate where they have to constantly bid and fight for funds for essential research—e.g. into Australia's wildlife and biodiversity.

To reflect on the past year of the Tropical Savannas CRC is to observe that we continue to build on the store of knowledge and the network of our collaboration that is being built in the northern third of the Australian continent. The demand for the CRC's expertise is exemplified by the fact that it now deals with many enquiries for information and the fact that we are attracting funds for relevant projects from non-usual sources. However, there is no way that the CRC can be considered as a commercial entity with sustaining products to be sold into commercial markets. We are directed to research in the sciences to provide a basis on which we can serve, relate to and enhance the lives of the people living in some of Australia's most remote locations. The commercial benefits from the CRC's activities in this sense can be regarded as diffuse, e.g. better pasture management, improved fire management, a deeper understanding of the ecosystems that underlie endeavours on the land. We work to rigorously identify outback livelihoods in a setting of rich biodiversity, significant cultural heritage and potentially enhanced capacities for our more traditional primary and tertiary industries. Methodologies developed, or being developed, in areas such as uncontrolled wildfires and invasive species have national application in many instances. We are on the frontline for many possible incursions of invasive species.

The Tropical Savannas CRC is now in a unique position to play the role of broker, and an honest broker at that, in the issues and challenges of an environmental, economic and social nature. To my mind the three key groups we do and will continue to work with are, firstly, the Aboriginal people, who despite a mountain of difficulties, clearly have their economic, social and cultural future based in the north of the continent. Secondly are the links and networks being built with government agencies, educational institutions and researchers, where collaboration can better meet the challenges we are presented with. Thirdly are the industries of the north, the main ones of which are long standing, such as pastoralism and mining, and those that are emerging, such as tourism.

The essential intellectual rationale for the continued public support of the CRC is that by researching and exploring the natural systems of the environment and the aspirations of the people living in the savannas we may be able to prevent the degradation of both fragile and resilient landscapes, systems and species that so marks much of the rest of Australia, where the costs of repair are immense. Short-term vested interests have always historically been able to allow a process of denial to play out. We now know enough to prevent and address the damage done and rising challenges respectively.

I will leave it to our CEO, Professor Gordon Duff, and our staff to point out the highlights of the past year. Much of the Board's work is in focus, review and accountability—but it is performance that is crucial. The Board is pleased that of the 24 internal and 14 external projects of the year in review that nearly all have shown, or are showing, tangible results. We now have 30 postgraduate students to supervise and it is pleasing to record that our graduating and postgraduate students all seem to be gaining employment in areas relevant to their skills and knowledge. The publication, information sharing, extension and face-to-face to activities continue to be of a very high and useful standard.

I join with the Board in thanking all people working with CRC for another year's productive work.

The Hon John Kerin, Chairman of the Board

Structure and management

Structure

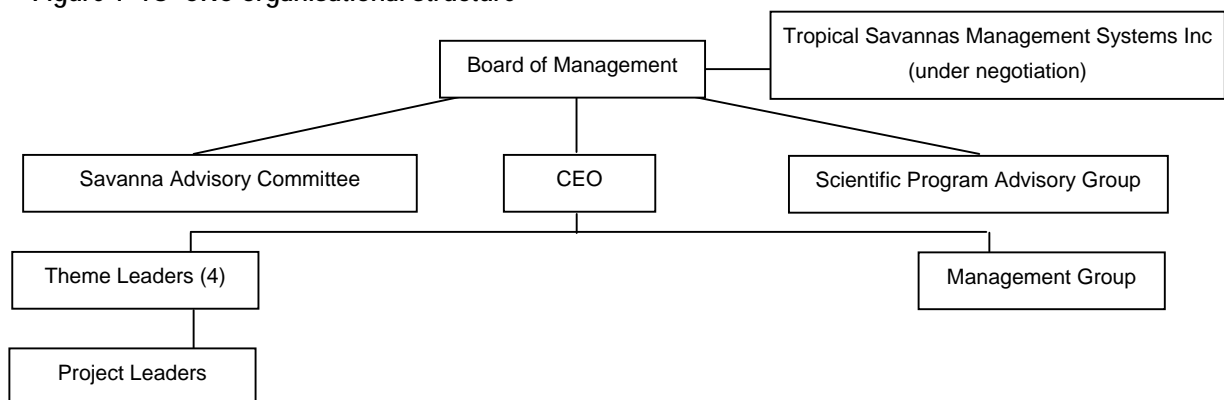
The sustainable use and conservation of northern Australia is the focal point of the TS–CRC. The Centre is an unincorporated joint venture between the Commonwealth and the partner agencies listed below:

- CSIRO
- Department of Agriculture Western Australia
- Department of Conservation and Land Management (CALM WA)
- Director of National Parks
- James Cook University (JCU)
- Meat & Livestock Australia (MLA)
- North Australian Indigenous Land & Sea Management Alliance (NAILSMA)
- Northern Territory of Australia
- Charles Darwin University (CDU)
- The State of Queensland
- The University of Queensland (UQ)

As a result of the business plan provided to the Commonwealth in July 2001, the TS–CRC has adopted the organisational structure shown in Figure 1. This new structure has proved to be a sound framework for implementing the Centre’s strategic directions.

The TS–CRC has a clear strategic framework for the conduct of its scientific, educational and financial business. Stakeholders are actively involved in the policy, strategic and operational decision making of the Centre through membership of the Board of Management and Savanna Advisory Committee (SAC).

Figure 1 TS–CRC organisational structure



Board of Management

The TS–CRC Board of Management plays an important leadership role. The Board must be analytical and decisive, while at the same time mindful of the need to consult with, understand and incorporate the needs of partner agencies and stakeholders.

Equal representation on the Board between stakeholders and partner agencies is an important mechanism for ensuring that this leadership is provided and that the key result areas of the Centre are achieved.

The Board of Management met three times during the past year. The meetings took place in Darwin in September 2004, in Townsville in March 2005, and in Darwin during June 2005. These meetings were held consecutively with SAC meetings. The independent chair of the Board of Management is **the Hon. John Kerin**.

Membership as at 30 June 2005

Representatives from the TS–CRC partner agencies

Dr David Ritchie, Northern Territory of Australia

Dr Greg Robbins, State of Queensland

Dr Renata Paliskis-Bessel, State of Western Australia

Prof. Bob Wasson, Universities

Dr Andrew Johnson, CSIRO

Mr Peter Wellings, Director of National Parks

Stakeholder representation

Mr Darryl Pearce (Chair, Savanna Advisory Committee)

Dr Barry Traill TWS (Conservation sector)

Mr Peter Yu, NAILSMA (Indigenous sector)

(Mining sector) Vacant following the relocation and resignation of Mr Craig Stewart

Mr John Courtenay, Probe (Tourism sector)

Mr Tom Stockwell, NABRC (Pastoral sector)

Replacements

During the past year Dr Renata Paliskis-Bessel replaced Mr Charlie Thorn as the representative for Western Australia, Prof Bob Wasson replaced Prof Charles Webb as the universities member, Mr John Courtenay replaced Mr Rick Murray who moved on to the Advisory Committee for the tourism sector and Dr Barry Traill took up the vacant conservation sector seat and Mr Craig Stewart resigned due to relocation and is not yet replaced.

Rob Taylor represented defence at the latest SAC meeting and it is hoped that he will stay as the defence representative.

The Board authorised the CEO to continue the search for a senior mining industry representative to fill the vacant position on the Board. This person should be capable of presenting a broad strategic view from a mining industry perspective.

Savanna Advisory Committee

The TS–CRC conducts research, communication and education activities for a range of stakeholders involved in natural resource management in northern Australia. These stakeholders include Aboriginal and conservation interests and the pastoral, defence, mining, and tourism sectors. Stakeholders formally contribute to strategy and program development through the SAC. This Committee is established by, and reports to, the Board of Management. The Committee met three times during the past year in Darwin and Townsville.

Mining industry representation

The Minerals Council of Australia has decided it is not in a position to nominate suitable mining industry candidates to fill vacant positions on both the Board and SAC. A letter confirming this was tabled. However, Ross McDonald, Environmental Advisor for Gemco, Groote Eylandt, expressed an interest in representing the mining industry on SAC. His expression of interest, together with a

supportive covering letter from the Northern Territory Minerals Council, were both tabled. The Board agreed that Ross McDonald was a suitable candidate for SAC and endorsed his appointment.

Membership as at 30 June 2005

Mr Darryl Pearce (Chair), Indigenous Management Group, Perth, WA	Mr Tony Law , DoD, NT (Defence sector)
Ms Jann Crase , ECNT (Conservation sector)	Mr Roger Landsberg , Trafalgar Station, Qld (Pastoral sector)
Mr Ross Brunckhorst , Pastoral Enterprises, Qld (Pastoral sector)	Dr Wayne Hall , MLA, Qld (Pastoral sector)
Mr Ross Browning , MacArthur River Mines, NT resigned due to changed responsibilities and has not been replaced (Mining sector)	Mr Rick Murray (Tourism sector)
Mr Tom Vigilante , KLC, WA (Indigenous sector)	Dr Sonia Tidemann , Batchelor Institute of Indigenous Tertiary Education, NT (Education sector)
Mr Paul Jenkins , ILC, SA (Indigenous sector)	

Replacements

During the year Mr Rick Murray replaced Mr Paul Styles for the tourism sector.

Scientific Program Advisory Group

The Scientific Program Advisory Group (SPAG) participated in the direction setting workshop in September 2004, and provided a report to the Board on the CRC's achievements, challenges and future directions.

Membership as at 30 June 2005

Dr John Vercoe (Chair), Consultant and Centre Visitor, Rockhampton, Qld	Mr Barney Foran , CSIRO SE, Canberra, ACT
Prof. Jon Altman , CAEPR, ANU, Canberra, ACT	Prof. Richard Hobbs , Murdoch University, Murdoch, WA
A/Prof. Jeff Coutts , Consultant, Toowoomba, Qld	Dr Roy Powell , CARE, Armidale, NSW

Management Group

The Management Group met formally twice during the year, and various members participated in a range of informal planning and review activities. The role of the Management Group is to:

- set strategic and tactical direction
- implement the strategy statement
- support the theme leaders and process
- be a sounding board for strategies
- monitor performance against the strategy statement
- develop strategies for project development.

Membership as at 30 June 2005

Prof. Stephen Garnett CDU, Darwin, NT	Dr Mick Quirk , QDPI, Brisbane, Qld
Prof. Gordon Duff CEO TS-CRC, Darwin, NT	Dr Paul Novelly , Dept. Agriculture WA, Kununurra, WA
Mr Brent Williams , DNRETA, Darwin, NT	Mr Brian Slatter , TS-CRC, Darwin, NT
Mr Joe Morrison , NAILSMA, Darwin, NT	Prof. Ockie Bosch , UQ, Gatton, Qld
Mr Jim Davis , Balkuna Cape York Development Corporation, Cairns, Qld	Dr Peter Whitehead , DNRETA, NT Govt
Dr Alan Andersen , CSIRO SE, Darwin, NT	Dr John Woinarski , DNRETA, Darwin, NT
Dr Peter Jacklyn , TS-CRC, Darwin, NT	Dr Penny Wurm , TS-CRC, Darwin, NT
Dr John Ludwig , CSIRO SE, Atherton, Qld	Dr David Garnett , TS-CRC, Darwin, NT

Commercialisation, technology transfer, utilisation

Strategies and activities

The year 2004–05, the fourth year of the Centre, saw our use and adoption strategies produce significant and striking results: from widespread use of the North Australian Fire Information fire mapping website to use of biodiversity monitoring to broad uptake of regional planning advice. These improved capabilities are now starting to produce better outcomes on the country and in communities.

These activities reflect a key goal of CRC: to produce research-based tools and information that tropical savanna land managers can use, that make a difference, and that enhance their ability to manage country sustainably.

In the north most of the land is managed by pastoralists, Aboriginal communities or park rangers, with many of them working in groups that effectively operate as small to medium enterprises (SMEs). Many other groups also have an impact on managing the tropical savannas, such as policy-makers, planners, Landcare and NRM coordinators and students. The CRC aims to provide all these groups with research-based tools and information that will produce better land management.

To achieve this goal, however, some key challenges in the tropical savannas need to be overcome:

- Researchers are often isolated and can find it difficult to establish the critical mass of people needed to produce useful, innovative research products.
- Research users, many of whom are in SMEs such as pastoral enterprises or indigenous land management corporations, are also isolated and do not have the access to information and expertise that allow them to use new research products effectively.
- This isolation is exacerbated by the cultural gulfs that often exist between researchers and the varied mix of research users.
- Researchers and research users have to deal with new, emerging natural resource management issues which have not been the subject of major research efforts.

These challenges imply we need to invest in people's skills and knowledge resources as part of the pathway to the development of innovative products. The following strategies are therefore used.

Fostering collaborative, participative research. The sparseness of the research community in the tropical savannas underlines the need to develop links across research disciplines, across industry sectors, and with researchers across Australia and overseas to achieve the critical mass needed to produce high quality, innovative tools and information for savanna land managers and planners.

Research needs to be relevant and useful, so it should be driven by the “pull” of users, not the “push” from researchers to get their projects funded. Therefore participative research, that involves end users many of whom are involved in savanna SMEs as active participants, is fostered in our projects. For example, the FIREPLAN project works actively with local groups of fire managers on fire management issues suggested by those groups.

This process will often involve establishing strong personal relationships on the ground between researchers and end-users that can bridge cultural distance, and will also involve using local knowledge together with researchers' knowledge. These links developed by the TS–CRC have had a significant role in enabling the Centre to attract considerable external funding from bodies that want to achieve on-ground results in northern Australia (see Table 1).

Investing in access to information and knowledge. Even relevant and practical research findings can end up on the shelf if the users and researchers do not have the capacity to ensure those findings are used effectively—and many savanna communities and researchers lack such capacity. User needs include better access to NCRM (Natural and Cultural Resource Management) options from across the tropical savannas and in 2004–05 the Centre started developing a Land Managers' website that will meet this need.

Often a greater need for research users is the capacity to use their own local knowledge systems more effectively, for example in many indigenous communities there is a desire to have traditional NCRM

knowledge more effectively passed on to the younger generation, and in many pastoral SMEs people want to be able to use their own and other pastoralists' local knowledge more effectively. This means that the TS–CRC uses people skilled in building such capacity in SMEs (for example in the *Indigenous Ecological Knowledge Project*, the *Integrating Research with Land and Sea Management Project* and the *Beef Industry Best Practice Project*) as well as using people skilled in brokering research know-how.

Developing better education and training. Savanna researchers also need additional skills, such as the ability to engage more effectively with indigenous communities and pastoral enterprises. The TS–CRC offers Masters and Graduate Diploma courses in Tropical Environmental Management that not only allows agency staff to learn about the latest NRM research, but exposes them to the issues and concerns of the varied group of research users in the savannas. In 2004–05 the Centre developed a cross-cultural course for researchers and other agency staff engaged in savanna NRM. The Centre's PhD program aims to produce new researchers in tune with research users' needs. Refer to the Education section, p. 48.

Developing practical tools. One of the most effective ways of making research useful is to convert it into practical tools useful to research users. For example, rather than just publish guides on how to use satellite information in tracking fires, the TS–CRC has created a website that allows users with slower connections to track fires from their own properties and communities (see below). These tools feature integrated research findings and knowledge that could not be created easily by individual partner agencies.

Outcomes

• Knowledge-based Fire Management

Project Leader: Jeremy Russell-Smith

Each year around 80% of the area burnt by bushfires in Australia occurs in northern Australia—and better fire management is a crucial factor in sustaining productivity and biodiversity in the north. This NHT-funded project is working with land managers across northern Australia to bring together practical fire management options, guidelines and information to help manage fire better. The project has employed a group of fire project officers who have established effective on-ground networks with fire managers across northern Australia. The project has developed interim fire management guidelines for Western Australia, the Northern Territory and Queensland and a range of fire management options have been gathered from extensive consultation with stakeholders.

The project is developing a suite of three websites and other media driven by these stakeholder networks:

- Land Managers' website in which fire management information can be integrated with information on biodiversity management, and vegetation dynamics with links to other aspects of land management
- Website on bushfires for the general community is being developed with a particular focus on schools. The project is liaising with other website information providers in this area such as the State Governments and the Bushfires CRC to ensure we develop information resources that complement rather than duplicate the efforts of other information providers
- Fire mapping website that helps fire managers locate fires (see below).

Links were established with training providers and workshops are being conducted to help fire managers use web-based and digital information sources to their full potential.

• North Australian Fire Information website

Developers: Chris Devonport, Ecobyte Systems; Peter Jacklyn, TS–CRC

The Communication Project and the FIREPLAN project developed a website for northern fire managers – the North Australian Fire Information (NAFI) site. This website <www.firenorth.org.au> maps active fires and previously burned areas to within a kilometer or less on a highly detailed map using close-to-real-time data from satellites. In the 2004 fire season the NAFI site was widely used by land managers in the Kimberley, the top end of the NT and north Queensland. In the top end on the NT it is now one of the most regularly used websites by land managers.

“The North Australian Fire Information website has been the single most important improvement in fire management technology in the NT in the past 10 years. It has given land managers accurate daily information on location and extent of fires, and has proven

an invaluable tool in both strategic fire management planning and monitoring, and in tactical fire fighting responses.” —Brent Williams, CEO Bushfires Council of the NT

- **Cattle Industry and biodiversity conservation**

Researcher: Alaric Fisher, NT DNRETA

For the first time the north Australian cattle industry has fully integrated biodiversity conservation into a major grazing trial. Research supported by the TS-CRC suggests that, amongst many plant and animal groups occurring on cattle country, the key species to protect are grazing-sensitive ones that are only abundant in areas that are lightly grazed (usually those areas distant from watering points). The best interests of biodiversity may therefore be served by maintaining diversity of grazing regimes across the landscape. The Pigeon Hole Project (initiated by Heytesbury Beef and Meat & Livestock Australia) is now testing this idea, which could point the way for ‘biodiversity-friendly’ management of the extensive grazing lands of northern Australia. The adoption of biodiversity research into the trial builds on collaboration between the Tropical Savannas CRC, government agencies and the northern pastoral industry.

“This is truly a cooperative research project within the TS-CRC. It is the diversity of views, representativeness of the group and the mutual respect of the participants that will ensure the outcomes of the project are practical, realistic and have a significant and lasting impact on the Pastoral Industry and the sustainable management of this environment.”—Steve Petty, Heytesbury Pastoral Company

- **Biodiversity Information for Conservation managers**

Information Officer: Gay Crowley, TS-CRC

One of Australia’s major natural assets is its tropical biodiversity—an asset that ultimately underlies the livelihoods of groups like park rangers, private wildlife conservancies and ecotourism operators (who may also be graziers). Critical to maintaining this biodiversity are reliable methods of monitoring biodiversity that can be compared across the tropics. The TS-CRC’s biodiversity project has used its links across WA, NT and Queensland to assemble a core group of ecologists who have developed practical and robust methods of assessing biodiversity on a range of tenures (see page 33 for details).

The year in report also saw the establishment of a TS-CRC project that will make practical biodiversity management techniques more accessible to conservation managers across the tropical savannas. An experienced ecologist and conservation manager, Dr Gay Crowley, was appointed to consult a range of land managers (conservation agencies, Indigenous groups, pastoralists and regional NRM bodies) to determine the information they require and the forms this should take. She will also develop a directory of all existing relevant information sources for the tropical savannas. Possible outputs of this project will include booklets on biodiversity values in different areas, case studies of best practice land management that helps to protect biodiversity, databases recording the distribution of plants and animals and their responses to different management regimes, and web-based information tools.

- **Rapid Riverbank Assessment**

Researchers: Michael Douglas and Ian Dixon, CDU

Land managers in northern Australia will soon have a standard, practical method for rapidly appraising the condition of one of the most vital—and vulnerable—areas of savanna landscapes: the vegetation surrounding their rivers, creeks and streams.

Riparian zones—the habitats alongside rivers, waterholes and streams—are critical elements of the savanna landscape. They help maintain water quality, the shape and form of streams as well as biodiversity in streams and surrounding savanna, thereby making major contributions to biodiversity, cultural values and the economy. However, savanna riverbank zones are highly vulnerable to the effects of disturbances such as weed invasion, feral animals, fire and overgrazing.

Methods to appraise riverbank condition rapidly have been developed for other regions in Australia but no method has been developed and tested for use across the savannas—until now. By working closely with land managers—particularly those in agencies that are responsible for landscape monitoring, the TS-CRC’s Savanna Riparian Health Project has developed a practical and quick method of assessing northern riverbanks—the Tropical Rapid Appraisal of Riparian Condition (TRARC).

This tool was successfully trialled with a range of users and has continued to be refined jointly with JCU and with Land and Water Australia. The team was successful in involving the Department of

Environment and Heritage in further adoption and development of the TRARC and the discussion of having the TRARC adopted under the National NRM Monitoring and Evaluation.

- **Reports helps Regional Planning**

Researcher: Geoff McDonald, CSIRO SE

There are critical constraints faced by planners and managers in establishing regional NRM plans in Queensland and these have now been documented in a comprehensive Benchmarking Report produced by the TS-CRC's *Healthy Savanna Planning Systems* project. The Report also evaluates the effectiveness and adequacy of state and regional level responses to these challenges. Finally future directions, in terms of implications for improved planning practice, policy and program design and delivery and more constructive NRM partnerships are outlined. As the project has worked closely with regional planners and managers in this project, the report's findings have been taken up with interest by a range of regional planners. Submissions arising from the report have been made to the Queensland and Commonwealth Governments. The next phase of the project will work with regional planners in the NT and WA.

The project has also contributed to the development of the Integrated Natural Resource Management Plan for the Northern Territory, in cooperation with the Landcare Council of the NT and NT DNRETA planning team in late 2004.

- **Knowledge Building**

Researchers: Okie Bosch, Karl Smith, UQ

The TS-CRC's Knowledge-building project has worked with QPWS staff in north Queensland using a Bayesian Belief Network (BBN) to analyse management systems and identify operational stumbling blocks in fire management. This tool is now used by QPWS and has produced improvements in fire management planning. QPWS Regional Directors and EPA Executive Directors are interested in the ongoing use of the process and models developed.

The project team also worked with the Northern Gulf Regional Management Group who used BBN models to map pathways to regional planning targets and assess risks to achieving targets in developing their Regional NRM Plan. There is now interest from other regional NRM bodies in Queensland in applying the BBN modelling approach to their regions.

- **Publications Impact across the Savannas**

Publications and Web Manager: Kate O'Donnell, TS-CRC

The TS-CRC plays a key role in synthesizing NRM knowledge from across north Australia and making it easily accessible to NRM stakeholders. In 2004-05 the TS-CRC saw a significant increase in publication sales with over 1850 TS-CRC books, booklets, CDs or reports on sustainable land management sold. Another 923 publications on NRM were distributed free of charge. These figures do not include the Centre's newsletters. Most of these publications were on practical land management techniques such as the 175 copies of *Savanna Burning* sold. They also include publications that were sold through other agencies: Queensland DPIF sold 170 copies of *Healthy Rangelands*, aimed at Grazing Land Managers, and Barker Souvenirs distributed 993 copies of *Termites of Northern Australia*, jointly produced with CSIRO and aimed at tourists.

- **Education Impact in Indonesia**

Education Coordinator: Penny Wurm, TS-CRC

The TS-CRC's Higher Education Project has been instrumental in securing a MoU between Satya Wacana Christian University (UKSW) in Java, Indonesia and Charles Darwin University (CDU), and plans are underway for units from the TEM program to be integrated into the Magister program at UKSW. Funds have been secured from the Crawford fund for a scholar and educator from UKSW to attend a conference and workshop at CDU in July 2006, and further. This work will involve collaborative grant preparation, curriculum development and capacity building in Indonesia and Australia.

Future Directions

Much of the effort to date has gone into providing NRM stakeholders with knowledge and tools and although these tools are ultimately focused on particular NRM outcomes such as better fire and grazing management, it can take years for these outcomes to arise. The next step is to assess the extent to which such outcomes are achieved. The Centre for International Economics has recently been contracted to assess the impact of the TS-CRC on natural and cultural resource management in the tropical savannas, exploring the economic, environmental and social impacts. The TS-CRC will also be actively investigating the impacts of its tools, networks and information on NCRM practice.

Table 1 Consultancies and Research Contracts

	Type	Consultant	Consultancy	Funding Source	Amount
1	Government	J. Russell-Smith TS–CRC / NT BFC	Improving Greenhouse emissions estimates associated with savanna burning in the Northern Territory	Greenhouse Office	\$400,000 May 05–Jun 08
1	Industry	L. Felderhof, EPA (Qld), JCU	Fire management planning	Ergon Energy	\$80,000
1	Government	J. Morrison, TS–CRC	Indigenous engagement in Water Management across Northern Australian Indigenous Estate	LWA	\$69,100 May 05–Dec 05
2	Government	S. Setterfield M. Douglas, CDU/TS–CRC	Phenology and seed biology of annual mission grass in Kakadu National Park	Parks Australia North, Dept of Environment & Heritage	\$9270
1	Government	G. McDonald, CSIRO SE S. Dawson UQ A. Vagg, UQ	Development of a Northern Gulf Draft Level Regional Plan	NGRMG via NHT	\$69,500
1	Government	G. Duff, TS–CRC	Better fire management planning in the rangelands	DEH	\$80,000
1	Government	G. Duff, TS–CRC	Integrated natural and cultural resources management in the east Kimberly	LWA / ILC / AgWest	\$1,154,000 Mar 04 – Dec 05
1	Government	G. Duff, TS–CRC	Developing knowledge-based fire management for northern Australia savanna communities: Phase 1	NHT	\$1,897,277 Apr 04 – Jun 06
1	Government	A. Petty, UC (Davis) /CDU	Mapping and monitoring channel dynamics and saltwater intrusion in the South Alligator Valley, Kakadu National Park.	KNP	\$10,450
2	Industry	R Cowley, NT DPIF&M	Developing sustainable carrying capacities in the NT	MLA	\$158,840 Jul 05 – Dec 07
1	Industry	J. Russell-Smith	Fire Management of Woody Vegetation in Gulf Region	MLA	\$418,000 Oct 02–Sept 06
2	Industry	A. Fisher, NT DNRETA	Biodiversity conservation in productive grazing systems in northern Australia	MLA—Donor Company scheme	\$116,792 Mar 03–Jun 06
2	Industry	A. Fisher, NT DNRETA	Sustainable development of northern grazing lands	MLA—via sub-contract with CSIRO SE	\$124,145 Mar 03–Sep 06
1	Government	A. Fisher, NT DNRETA	Incorporating biodiversity monitoring into rangeland condition assessment	Land and Water Australia	\$188,240 Sep 01 – Jun 05
2	Government	A. Kutt, QEPA	Northern Gulf preliminary biodiversity surveys	NHT	\$40,000 Jun 04 – Nov 04

Table 1 Consultancies and Research Contracts cont.

	Type	Consultant	Consultancy	Funding Source	Amount
1	Community	J. Morrison, TS-CRC	North Australian Indigenous leadership, scholarship and communication	Christensen Fund	\$115,532 Sep 04–Aug 05
1	Government	G. Duff, TS-CRC	Dugong and marine turtle management	NHT	\$3,800,000 Jan 05–Jun 07
1	Government	J. Morrison TS-CRC	Development of Indigenous Knowledge capacity across Northern Australia	LWA	\$292,860 May 04–Jun 06

1. Consultancies administered by TS-CRC 2. Grants administered by TS-CRC Partner

IP Management

All intellectual property generated by the Centre’s activities is owned by the Centre partners as tenants in common in proportion to their participating shares. The partners are obligated to use their best efforts to identify IP generated by Centre activities, and to vest ownership of such IP in the partners. If patenting or other registrable forms of IP protection are pursued it is to be in the joint names of all the partners as tenants in common proportional to their participating shares.

The Centre partners may bring background intellectual property to the Centre’s activities - and such IP remains the property of the partner concerned but can be used royalty-free by the other partners in the Centre’s activities other than for commercialisation. The Centre’s Business Manager maintains a register of such background IP.

End-user Involvement—See Table 3: Centre research users and the basis of interaction

Table 2 Progress against milestones

Milestones	Progress
1. The Centre’s incorporated entity managing intellectual property and product commercialisation	This development has been put on hold in consultation with the CRC Secretariat.
2. The Savanna Advisory Committee providing direction to the program	The SAC has regular meetings and strong input to research program
3. Specific issue forums established and well supported	The TS–CRC has hosted numerous well-supported forums. A forum on vegetation change has led to a new TS–CRC project on that issue; A forum on influencing policy was well supported and is influencing Theme 3.
4. Researchers participating in education and extension program activities	Researchers act as supervisors for PhD students, as lecturers in MTEM course as advisors in Tropical Savannas Knowledge in schools Project. Researchers involved in participative research and interact with users across the portfolio.
5. Regional Management Studies established and supported by local participation	The TS–CRC now supports a number of regional, on-ground studies that are driven by research users. These studies are associated with projects that include the FIREPLAN project and the NHT-funded Turtle and Dugong Project.
6. Easily accessible research findings and information	TS–CRC research findings are accessible in the form of practical tools, plain language publications and websites aimed at a range of research users.

Table 3 Centre research users and the basis of interaction

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Pastoral industry sector								
Meat & Livestock Australia	✓	✓	✓	✓	✓	✓		
North Australian Beef Research Council	✓		✓	✓		✓		
Agforce Qld				✓				
Kimberley Beef Research Committee				✓				
Kimberley Aboriginal Pastoralists Association				✓				
NT Cattlemen's Association				✓		✓		
Heytesbury Beef			✓	✓				
Australian Agricultural Co.				✓				
North Australian Pastoral Co.				✓				
Stanbroke Pastoral Co.				✓				
Katherine Pastoral Industry Advisory Committee				✓				
Barkly Region Advisory Committee				✓				
Conservation interest groups								
World Wide Fund for Nature	✓			✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Conservation interest groups cont.								
Environment Centre NT	✓			✓				
Kimberley Conservation Group				✓				
Scientific Council of Wild Country				✓				
Queensland Conservation Council	✓			✓				
Conservation Council of WA	✓			✓				
Australian Conservation Foundation				✓				
Birds Australia				✓		✓		
Mining industry sector								
MIM Group of Companies/McArthur River Mining Pty Ltd	✓			✓				
Earth, Water, Life Sciences Pty Ltd				✓				
Queensland Nickel			✓	✓				
Ergon Energy				✓				
Nabalco			✓	✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Aboriginal community groups								
Balkanu Cape York Development Corporation	✓		✓	✓				
Bawinaga Association				✓				
Cape York Land Council			✓	✓		✓		
Kimberley Land Council	✓		✓	✓		✓		
Kimberley Aboriginal Law and Culture Centre				✓				
Indigenous Land Corporation	✓			✓				
Northern Land Council	✓		✓	✓		✓		
North Australian Indigenous Land & Sea Management Alliance	✓	✓	✓	✓				
Jawoyn Association				✓				
Yanyuwa Community				✓				
Carpentaria Land Council			✓	✓				
Central Land Council				✓				
Torres Strait Regional Authority			✓	✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Tourism industry sector								
Northern Gateway Pty Ltd				✓				
Australian Tourism Council (NT)	✓			✓				
Tour Guides Association NT				✓				
Savannah Guides Ltd			✓	✓				
Gulf Local Authorities Development Association				✓				
Undara Experience				✓				
Tourism Queensland				✓				
Funding agencies								
Australian Centre for International Agricultural Research			✓	✓				
Land & Water Australia			✓	✓	✓			
Environment Australia (Biodiversity Group)				✓	✓			
Environment Australia (State of Environment)				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Funding agencies cont.								
Rural Industries Research Development Corporation				✓				
Bureau Resource Sciences				✓				
Australian Research Council				✓				
Natural Heritage Trust				✓			✓	
Government agencies								
Australian Defence Force	✓		✓	✓				
Bureau of Meteorology				✓				
Great Barrier Reef Marine Park Authority				✓				
Department of Agriculture WA	✓	✓	✓	✓				
Department of Land Administration WA			✓	✓				
Department of Conservation and Land Management WA	✓	✓	✓	✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Government agencies cont.								
Bushfires Council of the NT			✓	✓		✓		
Northern Territory Department of Business, Industry and Resource Development	✓	✓	✓	✓				
CSIRO Sustainable Ecosystems	✓	✓	✓	✓				
CSIRO Land and Water			✓	✓				
CSIRO Climate and Atmosphere				✓				
Queensland Department of Primary Industries	✓	✓	✓	✓				
Queensland Department of Natural Resources and Mines		✓	✓	✓				
Queensland Parks and Wildlife Service			✓	✓				
Queensland Environment Protection Agency		✓	✓	✓		✓		
Australian Greenhouse Office			✓	✓				
North Australia Rural Fire Managers' Forum				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Government agencies cont.								
National Land and Water Resources Audit				✓				
Western Australia Fire & Emergency Services Authority				✓				
Parks Australia North	✓	✓	✓	✓	✓			
Queensland Fire and Rescue Authority				✓				
NT Department of Infrastructure, Planning and Environment	✓	✓	✓	✓		✓		
Cooperative Research Centres								
CRC for the Conservation and Management of Marsupials				✓				
CRC for Tropical Rainforest Ecology and Management				✓				
CRC for Aboriginal and Tropical Health				✓		✓		
CRC for Desert Knowledge			✓	✓				
CRC for Freshwater Ecology				✓				
CRC for Cotton				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Cooperative Research Centres cont.								
CRC for Sustainable Tourism			✓	✓				
CRC for Catchment Hydrology			✓	✓				
CRC for Greenhouse Accounting			✓	✓				
CRC for Tropical Plant Protection			✓	✓				
CRC for Weed Management			✓	✓				
Community groups and professional bodies								
Desert Uplands Build-up and Development Strategy Committee				✓				
Dalrymple BeefPlan Producer Group				✓				
Sturt Plateau Best Practice Group				✓				
Victoria River District Conservation Association				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Community groups and professional bodies cont.								
Northern Gulf Resource Management Group				✓				
Cape River Management Group				✓				
Cape York Peninsula Development Association			✓	✓				
Torrens Creek Landcare Group				✓				
Burdekin Dry Tropics Board				✓				
Fitzroy Basin Association				✓				
Victoria River District Regional Bushfire Council Committee				✓				
Roper River Landcare Group				✓				
Coastcare				✓				
Burdekin Rangelands Strategy Implementation Group				✓				
Landcare Council of the NT			✓	✓	✓			

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Community groups and professional bodies cont.								
Southern Gulf Catchments Inc.			✓	✓				
WA Rangelands Regional Group			✓	✓				
Kimberley Regional Fire Management Project			✓	✓		✓		
Upper Burdekin Landcare Group				✓				
Dalrymple Landcare Committee				✓				
Northern Territory Chamber of Commerce				✓				
Centralian Land Management Association				✓				
Karumba Progress Association				✓				
Educational institutions								
Centre for Indigenous Natural and Cultural Resource Management, NTU				✓				
University of Western Sydney				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Community groups and professional bodies cont.								
James Cook University	✓	✓	✓	✓		✓		
University of Queensland	✓	✓	✓	✓		✓		
Curtin University				✓				
Charles Darwin University	✓	✓	✓	✓		✓		
University of Melbourne			✓	✓				
Australian National University	✓		✓	✓		✓		
Central Queensland University				✓				
Batchelor Institute of Indigenous Tertiary Education	✓			✓		✓		
Key Centre for Tropical Wildlife Management, NTU				✓				
Murdoch University	✓			✓				
University of Adelaide				✓				
South Australian Museum				✓				
International collaboration								

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Community groups and professional bodies cont.								
Colorado State University			✓					
University of Virginia			✓					
Indonesian fire managers (through ACIAR)			✓	✓		✓		
University of Ruhr			✓	✓				
University of Florida				✓		✓		
NASA, USA			✓	✓				
Educational institutions								
University of Wurzburg			✓	✓				
Texas A&M University								
University of London				✓				
Royal Botanic Gardens, Kew				✓				
Conservation International, USA				✓				
CSIR, South Africa				✓				
University of Cape Town				✓				

Table 3 Centre research users and the basis of interaction cont.

Organisation	Represented on Board, committees	Partner agency	Collaborative research	Information/ research exchange	Contract research	Cooperative training	Collaborative grants	Contracted by Centre
Educational institutions								
Natural History Museum, London				✓				
Japanese Space Development Agency			✓	✓				
University of California				✓				
European Space Agency				✓				
Institute Superieur d'Agriculture Rhone Alpes				✓				
South African National Park Service			✓	✓				
Satya Wacana Christian University (Indonesia)				✓		✓		

Research

THEME 1 LANDSCAPE ECOLOGY AND HEALTH

Leader: Dr John Ludwig, CSIRO SE, Atherton

Summary

The Landscape Ecology and Health theme aims to increase our knowledge on how savanna landscapes function so that we can maintain or improve their health. Four projects are grouped in this theme:

1. Soil health in savannas (Tracy Dawes-Gromadzki, project leader)
2. Savanna carbon dynamics (Chris Stokes & Dick Williams, co-project leaders)
3. Exotic Grasses in savannas (Samantha Setterfield & John Clarkson, co-project leaders)
4. Savanna riparian health (Michael Douglas, project leader).

Key attributes of these four projects are:

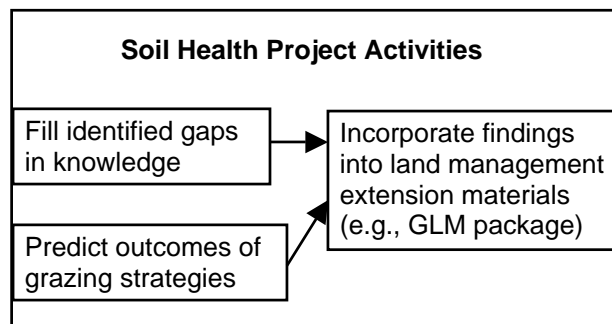
- they are all mature projects or new projects that build on at least three years of previous research;
- they now largely focus on management outcomes with clear approaches to achieving impact; any basic research is aimed to fill priority knowledge gaps; and
- within these project, gaps in basic knowledge are being largely filled by the research of post-graduate students.

Progress

Project 1.1.3: Soil health in savannas—Leader: Dr Tracy Dawes-Gromadzki, CSIRO SE, Darwin

This is a new project that builds on findings from a previous project on *Soil biota, nutrients and water in savannas*, which was led by Garry Cook and Mike Webb. A final report for this three-year project is complete and can be downloaded from the TS-CRC website: http://savanna.cdu.edu.au/research/projects/carbon_nutrients.html

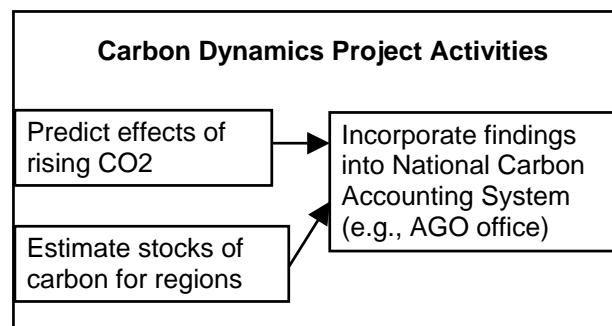
As leader of the new soil health project, Tracy Dawes-Gromadzki has developed strong linkages with land management agency people. Her aim is to ensure that there are defined activities or pathways to adoption for new findings from the project, as illustrated in the figure.



This new project is also closely aligned with Meat and Livestock Australia's Wambiana grazing trial, located near Charters Towers, Queensland, where vegetation and soils are being monitored for different grazing strategies.

Project 1.1.4 Savanna carbon dynamics—Leaders: Dr Dick Williams, CSIRO SE, Darwin Dr Chris Stokes, CSIRO SE, Townsville

This is also a new project that builds on a previous three-year project. A final project report is forthcoming for this three-year project from Chris Stokes or Dick Williams. A key product is a



forthcoming special issue of the *Australian Journal of Botany* titled: “Carbon accounting and land management in Australian tropical savannas: addressing the uncertainties”. Dick Williams is serving as Editor of this special issue.

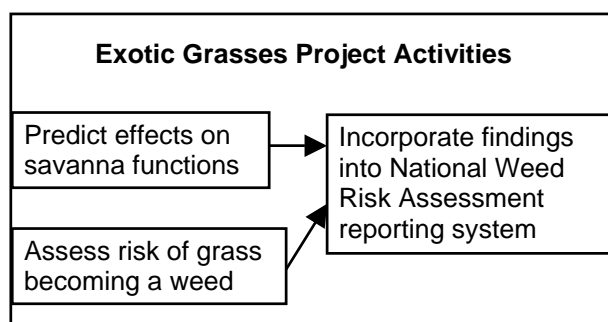
Dick Williams is also leading an activity to use statistical models and remote sensing techniques to scale-up results on carbon stocks from small sites to savanna regions. The aim is to ensure that these predictions and results on carbon stocks and flows for northern Australia are incorporated into the National Carbon Accounting System.

In 2004, Chris Stokes participated in an international meeting of global FACE (Free Air Carbon-dioxide Enrichment) sites. He reported on recent findings from the OzFACE site located near Townsville, which is the only FACE site within the global network that is located in savannas. Chris is also working with modellers, such as Adam Liedloff, to build knowledge gained from the OzFACE site into simulation models to predict the long-term consequences of rising CO₂ for savannas, as shown in the figure.

Dick and Chris have established strong working relations with the Greenhouse CRC and the Australian Greenhouse Office.

Project 1.1.5 Exotic Grasses in Savannas—Leaders: Dr Samantha Setterfield, CDU and John Clarkson, EPA (Qld)

In 2004–05, this project was in its third year of operation. Under the co-leadership of Samantha Setterfield and John Clarkson, and with contributions from Charles Darwin University colleagues, Michael Douglas and Lindsay Hutley, this project continues to increase our knowledge on how some introduced tropical grasses affect how savannas function, as illustrated in the figure.



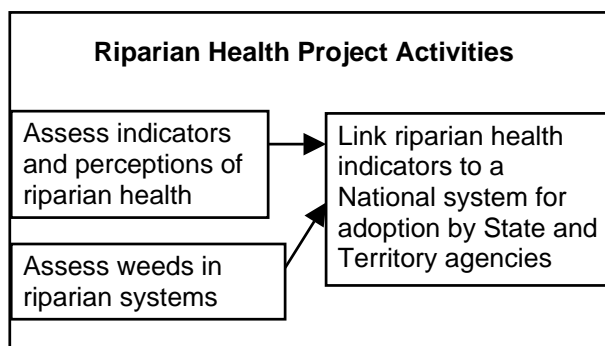
A major activity of this project is to develop a system to assess the potential environmental risks posed by some exotic tropical grasses; these risks can then be weighted against potential benefits.

This risk assessment activity is being carried out in close collaboration with the Australian Weeds Management CRC, and those land management agencies in states and territories responsible for controlling weeds.

This project continues to gain new knowledge from the research contributions of PhD students on Savannas CRC scholarships. These students include Natalie Rossiter and Kristine Brooks, at CDU, and Sarah Sheehan, at James Cook University.

Project 1.2.1: Savanna Riparian Health—Leader: Dr Michael Douglas, CDU

This project is also in its third year of operation. Under the leadership of Michael Douglas, it has developed a focus on finding indicators to rapidly assess the health of riparian systems across northern Australia, as shown in the figure. Michael, in collaboration with Ian Dixon, has linked their Tropical Rapid Appraisal of Riverbank Condition (TRARC) system to a National system for riparian health assessments. Michael has also been working with Land & Water Australia to establish a new research program for northern Australia’s tropical rivers.



A number of PhD students supported by the TS–CRC contribute significantly to this project, including Kasper Johansen (UQ), Caroline Chong, Ally Lankester and Sarah Sheehan (JCU), and Aaron Petty, Nicole Cranston and Gillian McCloskey (CDU).

Future Directions

I will be working closely with other Theme Leaders to develop a series of publications and other integrative products in time for our Fifth Year Review/Rebid, scheduled for early 2006. For example, Peter Whitehead, Joe Morrison and I are updating a publication on our unifying concept of what constitutes a healthy savanna.

The project on soil health will be in its second year. A key strength is that the project's leader, Dr Tracy Dawes Gromadzki, is establishing networks with a number of land management agency personnel to develop activities that will lead to the adoption of project findings.

The project on carbon dynamics will also be in its second year. This project has strong linkages with the Greenhouse Accounting and Bushfire CRCs, the Australian Greenhouse Office and the Northern Territory Government Greenhouse Unit. A key aim is to refine protocols for estimating carbon sequestration potential because of the international recognition that savannas may serve as carbon sinks. This project also adds value to a global network of FACE (Free Air Carbon-dioxide Enrichment) sites. The OzFACE site, located near Townsville in north Queensland, is the only savanna site within the FACE network.

The project on exotic grasses will be in its third year, with only a small amount of funding needed to complete project activities. This project is proactively contributing to a national Weed Risk Assessment system in collaboration with the Weeds Management CRC and with government agencies.

The Riparian Health project will also be in its third year. A key development of this project is that its Tropical Rapid Assessment of Riverbank Condition (TRARC) system is contributing to a national system for river health assessment.

THEME 2 INDUSTRY AND COMMUNITY NATURAL RESOURCE MANAGEMENT

Paul Novelly, Department of Agriculture, Western Australia, Kununurra

Theme 2 concentrates on the Key Result Area concerned with sustainable management systems. This is achieved by bringing together savanna researchers and land managers to develop practical tools and strategies for managing natural resources in ways that are both ecologically sustainable and contribute to economically and socially viable enterprises and communities.

In mid-2005 Paul Novelly became the leader of this Theme following the death of Jill Landsberg who had overseen the development of Theme 2 since 2001.

Although TS–CRC research activities are grouped into projects, project boundaries are frequently and deliberately blurred by sharing information, expertise, study sites and personnel. This is a particularly important feature of Theme 2's operation. It recognises that, although different stakeholders have different management priorities, all have concerns about how all the important natural resource issues are managed; hence all Theme 2 projects are strongly encouraged to work together in an integrated fashion across stakeholder boundaries.

Three Theme 2 projects are still in mid-term and due to continue operation during 2004–05. These are:

1. Beef industry best practice natural resource management (due for completion in 2005),
2. FIREPLAN: Fire management for savanna communities, and
3. Developing grazing management tools to improve savanna condition.

The other three current projects completed their first three-year term during 2004–05. One of these (*Project 2.3.3 Indigenous ecological knowledge*) will form the foundation of a new project and the other two (both dealing with biodiversity: *Project 2.2.3 Biodiversity monitoring* and *Project 2.1.2 Biodiversity on grazing lands*) have combined to form a new biodiversity project—*Project 2.4.2 Savanna biodiversity*—with a strong focus on product delivery. In addition, a major new project on assessing and managing woody vegetation has begun.

Progress

2.1.4 FIREPLAN: Fire management for savanna communities—Leader: Dr Jeremy Russell-Smith, BFCNT

The tropical savannas have the largest and most frequent fires on the Australian continent. This project works with savanna communities to help develop and implement regionally appropriate initiatives to improve sustainable fire management practices on savanna lands under all tenures, particularly in northern Australia, but also in the South East Asian region, as opportunities permit.

Project highlights included:

- *Developing, implementing and evaluating fire management for the Gulf region—Leader, Jim Kernot, QDPIF, Mareeba*

This activity was initiated through the Meat and Livestock Association at behest of Queensland Gulf cattlemen, and under the auspices of Northern Gulf Resource Management Group (NGRMG). This ongoing project is developing, implementing and evaluating fire management of woody vegetation in the northern Gulf region, in collaboration with CSIRO and the Queensland Department of Primary Industries & Fisheries. The project has focused on control of two species, gutta percha (*Excoecaria parvifolia*, Euphorbiaceae) and breadfruit (*Gardenia vilhelmii* Rubiaceae), on five core sites.

For both of the two main targeted species single fires resulted in less than 50% mortality. For breadfruit, the level of mortality from single fires was always less than 20%. These levels of mortality are considerably lower than those obtained for species such as mesquite and rubber vine, species for which fire is recommended as a key element of a control package.

However, the work does suggest there is value in examining (i) the effects of multiple fires; (ii) the consequences of even single fires for the structure of populations of woody species.

There was only one site which had been subjected to more than one fire. This site was burned the year before the project began and again in the first year of the project (August 2002). The apparent mortality level of breadfruit at this site was more than 50%, considerably greater than the less-than 20% recorded for other sites. This result is analogous to the situation with mallee eucalypts which are generally perceived as being resilient to fire and yet succumb to repeated autumn fires.

- *Investigating prescribed burning and wildfire control: Training and skills development for on-ground property level fire management in the Kimberley, WA—Leader, Jane Blackwood*

Working as part of the Kimberley Regional Fire Management Project funded principally by the Natural Heritage Trust. One major component has been to develop and train Indigenous fire control teams, as a basis for developing sustainable contract employment outcomes in natural and cultural resource management for indigenous communities.

- *Evaluating fire management on conservation reserves—Leader: Dr Jeremy Russell-Smith, BFCNT*

Fire management on conservation reserves, using a modelling approach, this project is in third and last year. It has proven very successful in bringing together regional Queensland Parks & Wildlife Service operational and program management staff to critically assess strengths and weaknesses in fire management delivery.

- *PhD research project—fire management planning associated with energy supply in north-west Queensland, Lesie Felderhof, EPA (Qld)*

This PhD research project involves the TS–CRC, Ergon Energy and James Cook University, and is being undertaken by Lesie Felderhof. It focuses on regional fire mapping to understand contemporary patterning and context, on-ground assessment of fire regime attributes, and ecological implications of different fire management options for biodiversity components. Ultimately, assembled data will be of value to Ergon to develop an ecologically appropriate Fire Risk Prediction Model.

- *Impacts of fire and its use for sustainable land and forest management in Indonesia and northern Australia—Leader: Dr Jeremy Russell-Smith, BFCNT*

Activities in eastern Indonesia have focused on the province of Nusa Tenggara Timur, and involved several major activities: (1) implementing strategic fire management in village settings; (2) developing fire mapping and associated GIS capacity; (3) assorted training; (4) transfer of the CRC's MTEM modules to Satya Wacana University, Salatiga; (5) and focused research activities.

The project, which finished in June 2005, was very successful, particularly with the implementation and uptake of the principle of strategic fire management, and technical training.

- *Fire information products for the savanna community—Leaders: Jeremy Russell-Smith, BFCNT, Peter Jacklyn, TS–CRC.*

Development of various fire information products for the savanna community, including:

- Fire information
- Indigenous issues
- Pastoral management issues

For more details see Outcomes of Knowledge-based Fire Management, [page 9](#).

- *Arnhem Land Fire Abatement Project—Leaders: Dr Jeremy Russell-Smith, BFCNT, Mr Peter Cooke, NLC.*

A new multi-faceted project in Arnhem Land that builds on core funding from NHT and the Australian Greenhouse Office (AGO), involving fire management and greenhouse emissions:

Fire management

- Over the past year substantial preventative fire management was undertaken. Despite this, extensive fires burnt much of the Arnhem Plateau. Quite clearly, insufficient preventative burning was undertaken (limited by funding realities) and, just as important, there was inadequate communication between some of the key stakeholder groups involved.

- Two Honours projects, with Ben Lewis looking at the characteristics and effectiveness of different strategic burning approaches, and Graham Blake developing a remote sensing approach to mapping heath communities on the Arnhem Plateau.

Greenhouse emissions

- With funding from AGO, further fieldwork undertaken in late dry season 2004, to address data gaps. A new proposal was also successfully submitted to AGO for funding 2005–08.

2.4.2 Savanna Biodiversity Shopfront—Leader: Dr Alaric Fisher, NT DNRETA

This project commenced in 2004–05, evolving from a set of three previous disparate CRC biodiversity-related projects. The highlights included:

- A major sub-project examining biodiversity response to a range of pastoral stocking rates and regimes, at Pigeon Hole station (Heytesbury Beef) in the VRD. This project, in part supplemented by additional external funding, is the largest Australian project that considers pastoralism-biodiversity options, trade-offs and impacts, and is particularly notable for its well-developed collaboration between a major pastoral company and Government and other biodiversity agencies.
- Further development of rangeland biodiversity monitoring protocols and products. This work, again partly supported by additional external funding, is tailored particularly at the relationship between biodiversity and other (currently widely-used) measures of land health and condition. This work will be completed in June 2005.
- Completion of a major series of biodiversity monitoring studies in Kakadu National Park, under contract with Parks Australia. This work has helped establish a “best-practice” benchmark for biodiversity monitoring in tenures that aim primarily to conserve biodiversity, and has identified species that are declining.
- A major biodiversity inventory study was commenced in 2004/05 at Groote Eylandt, NT, in partnership with traditional owners and Indigenous ranger group.
- In partnership with the Australian Wildlife Conservancy, a major biodiversity inventory at Mornington Station in the Kimberley was undertaken, with this information providing a baseline for proposed subsequent monitoring of responses to de-stocking and fire management.
- Available vertebrate fauna data for northern Queensland, including Birds Australia Atlas, all state and territory museums, unpublished and published databases available on EPA Wildnet system were collated and compiled. In addition, a series of 15,000 north Queensland bird records from a long unpublished diary (of the late Julian Ford, 1976 and 1986) were converted into a spatial layer with all records geo-referenced.
- Submission of NHT2 RCC bid *Biodiversity Management and Condition Assessment: a Toolkit for Queensland’s Tropical Rangelands* (\$720K over three years). Funding for this project has also been pursued through the Queensland NHT2 Strategic Reserve.
- Working with EPA Wildlife Ecology Unit (Brisbane) to develop a rapid assessment tool for biodiversity values in savanna rangelands. A draft BioCondition Tool has been developed and is currently being tested in the field.

2.1.1 Developing grazing management tools to improve savanna condition—Leader: Dr Neil MacDonald, NT DBIRD

This project (managed by Neil McDonald of NT Dept. of Primary Industries, Fisheries & Mines, Katherine) has four activities. These (and the progress during 2004–05) were:

- *Estimation of carrying capacity*

Although not easy, this activity is progressing well. Testing and customisation of existing carrying capacity methods has continued on the Sturt Plateau and Barkley Tablelands in the Northern Territory, and Desert Uplands and Gulf bioregions in Queensland. Extra funding was secured that allowed several Swiftsyn sites to be established in the Barkley area and in the arid zone. The project entails the ratification of some existing estimates as well as addressing issues such as the effect of a change in range condition on the carrying capacity. Activities are taking place in the three jurisdictions across northern

Australia. The report on evaluation of estimated safe carrying capacity against known stocking history and historical land condition changes in the VRD was completed in November 2004 by Jane Hamilton.

- *Decision support / risk management tools*

While this activity (in collaboration with Heytesbury Beef) has progressed well, further work is required to make it user friendly and of value to producers. The NT Innovations Fund and the LWA Innovations Fund have both been approached for funding but have not been successful.

- *Use of MODIS satellite data for paddock-scale monitoring*

This activity involves the development of the experimental design to test multi-scale satellite data for condition monitoring, acquisition of MODIS and Landsat satellite data, and completion of initial evaluation of how well they integrate with ground data. The proposed product is essentially a real time tool that allows a manager to “get an alert”, although the model will not be able to define the actual problem (the satellite assesses ‘cover’). Results indicated that MODIS was appropriate for cover change assessment (replacing the Landsat imagery), but that there will be a loss of scale (sensitivity) compared with Landsat. A final report is forthcoming.

- *Promotion of tools and applications*

Activities in Queensland are going very well, as is the Northern Territory where a new staff person will be recruited soon to assist in promotion (previously Trudi Oxley was doing this alone). The activities in Queensland link to the development of Desert Uplands and Gulf version of GLM package, and material has been prepared for the education package. Western Australia (Kimberley) has begun to promote the activities, with two “courses” held in the East Kimberley early in 2005.

2.2.1 Beef industry best practice natural resource management—Leader: Mr Stephen Tapsall, TS–CRC

This project is a partnership between industry groups (particularly meat & Livestock Australia) and TS–CRC researchers aiming to identify and promote best practice natural resource management, as implemented by top pastoralists across northern Australia. It is using the Best Practice Process (a tried and tested extension process in the beef industry, though usually focusing on production and economic performance), informed by expert advice from other TS–CRC researchers. The main product will be a set of principles and practices for environmentally sustainable NRM that could form the basis for an industry code of practice. Progress during 2004–05 included:

- Production and review of draft best practice documents (developed from the interview data and discussion with industry groups). These are currently in preparation.

2.3.3 Indigenous ecological knowledge for land management—Leaders: Mr Tom Vigilante, KLC; Mr Peter Cooke, NLC; and Mr Jim Davis, BCYDC

The Kimberley sub region focused resources on the Karajarri Land & Sea Management Project south of Broome. Main areas are:

- Coastal vehicle access management—management planning was undertaken to resolve the issue of uncontrolled tourist vehicle access on Karajarri lands which affect natural and cultural values. Additional funding was secured from the WA State Planning Commission and from Australian Government Envirofund and Coastwest.
- Plant-based community enterprise development - through initial ethno-ecological research, Karajarri women identified an interest in developing marketable products based on medicinal bush plants. Funding has been secured from the Kimberley Development Commission to progress this work.

All work for the Cape York component of the project was conducted on the traditional homelands of northern Kaanju, primarily focusing on the clan estates in the Upper Wenlock and Pascoe Rivers region, central Cape York. The primary focus has been on the ‘*in situ*’ conservation and transfer of local Kaanju knowledge by engagement of young and old people on country.

Discussion is underway with several research institutions as to possible collaborative programs to further develop Kaanju databases that more adequately reflect Kaanju ontologies, making them more applicable to Kaanju people.

One paper was published on sustainable homeland development, and another draft paper on northern Kaanju perspectives of weed management is ready for publication. An annotated checklist of vascular plants from Kaanju homelands is available from the Chuulangan Aboriginal Corporation.

The Northern Territory subproject has continued to develop Kabulwarnamyo as a centre for both research and management of the west Arnhem Land high plateau, with the following activities:

- Mapping focused on the upper Liverpool and Mann River.
- First draft Kundedjnjenghmi plant names database.
- Foundation work with Bardayal on geographic terms completed February 2004 will be further developed towards a more extensively illustrated and formatted document.
- At Kabulwarnamyo, a point of critical infrastructure mass was reached with completion of a dedicated Ranger Office with stable 240v power at Kabulwarnamyo. Rangers will now be able to engage with the computer aspects of the project and develop hands on skills with inputting and retrieving digital data.
- Further work was undertaken towards a pedagogic grammar (i.e. learner's guide) of Gundjeihmi and Kundedjnjenghmi.
- Continued work on the production of a documentary video (working title "Fire in the Land of Honey") made as a collaborative product involving Bardayal Nadjamerrek, the Manwurrk Rangers and Kim Mckenzie from CRIO, Canberra.

2.4.1 The dynamic savanna: Assessing and managing structural change in woody vegetation in northern Australian savannas—Leaders: Professor David Gillieson, JCU; Dr Garry Cook, CSIRO

This is a major new project on assessing and managing woody vegetation. It began in February 2005, and has a series of activities:

- *Activity 1: The Dynamic Savanna*
This activity involves the communications strategy, the structure and function of the Dynamic Savanna website and copyright, IP and data sharing.
- *Activity 2: Synthesis of existing information*
Various collections of Libraries and Government departments, as well as a large number of geo-referenced landscape photos from the CSIRO Land Systems surveys of the 1950s and 1960s have been examined at varying levels of detail. Additional resources are available in private collections in southern Queensland. The information is being collated using ANZLIC metadata tools, and these metadata will form part of the interactive Web GIS now being developed.
- *Activity 3: Calibration of aerial photography*
Aerial photos were obtained and field work completed on the effects of photo scale assessment sub-project, with analysis now proceeding. The gidgee structural change case study was completed, and a comparison of ground-based monitoring and aerial photograph assessments of structural change was also completed. A structural change assessment for the northern Desert Uplands is in progress. These works have proven relevant to the review of the Thinning Codes under the Queensland Vegetation Management Act.
- *Activity 4: Using landscape and aerial photography to document historical woody vegetation change*
This activity will assess woody vegetation change within identified case study regions across northern Australia, including the Northern Gulf in Queensland and the Western Australian Kimberley. Stakeholders identified the need for documentation of woody change as critically important. However, the activity will not only contribute documentation of change, but also an understanding of how change varies across regions, landscapes and management regimes.
- *Activity 5: Landholder experiences and perceptions of the extent, onset and causes of woody vegetation change*
This activity began in May 2005, and will record individual landholders' experiences of woody vegetation in the northern Gulf of Carpentaria and Kimberley region of Western Australia. It aims to

address significant knowledge gaps concerning woody thickening in the Gulf, and woody thinning in the Kimberley by collecting and synthesizing the experiential knowledge collected from local landholders. It will operate in close coordination with Activity 4, which focuses more on ecological change. In doing so, this activity will provide an organised body of information relevant to the local community.

- *Activity 6: Evaluating the costs, benefits and treatments of structural change*

Desert Uplands Case Study: Sixty sample sites were established on four properties in the northern Desert Uplands sampling a range of woody vegetation structural treatments. Flora and fauna sampling was conducted in mid-2004, and some of the data formed part of a Masters of Applied Science for student Adam Tassicker. A second more comprehensive sample is currently underway, incorporating more detailed biophysical data collection and economic modelling.

- *Activity 7: Scenarios for managing woody vegetation change*

This involves the use of modelling to extrapolate the TRAPS (Queensland DPIF database) data to confirm the Flames model can simulate the temporal and spatial variation in tree populations observed in the TRAPS studies, conduct a sensitivity analysis of some assumptions about recruitment and growth processes and examine using the model to assess the potential for managing tree density by focusing on particular stages in tree population dynamics such as post-drought recruitment. Modelling the Red Rocks site near Clermont has begun, and showed a good fit between model predictions of woody biomass and observed data over last 20 years.

Highlights and challenges

The year 2004–05 was another big year for Theme 2 and its various components. Highlights included:

- high levels of integration both within the theme and with other themes.
- Quality and continued commitment of staff.
- Strong contributions by PhD and Honours students.
- High standard of the many presentations made at conferences, workshops and field days.
- Continued high rate of publication in a variety of journals, proceedings and monographs, and requests from various media groups for interviews and reports.

One point of particular success were the demonstrated benefits of the constructive relationships between staff and a number of organisations, agencies; and individuals responsible for land management in the savannas. These have developed as a consequence of TS–CRC activities. This has been noticeable not only within the TS–CRC projects / activities, but also in other unrelated activities where the various partners to the CRC interact in other ways. See Section 9, Collaboration, page 57.

THEME 3 REGIONAL PLANNING AND MANAGEMENT

Leader: Peter Whitehead, Charles Darwin University, Darwin, NT

Summary

Theme 3 is concerned with social, economic and institutional influences on the way savanna communities interact with northern landscapes and the natural resources that those landscapes support. Most savanna residents outside the major centres depend directly on using natural resources for their livelihoods and wellbeing. Their capacity to use individual resources or classes of resources and to care for land is determined by a large array of factors, many of which have little to do with ecological sustainability of the use.

Most resources are allocated by statute to particular individuals or groups within the population. Those statutes also set many rules about the types and levels of use and the obligations associated with gaining access to resources. In addition, members of communities may apply many informal (non-statutory) rules to access or about acceptable resource management practice.

Given dramatic changes in landscapes, the size and distribution of human populations, the relative economic value of different resources, and the shifting recognition of many values that have no markets and hence no price, it cannot be assumed that these arrangements are well matched to the needs of regional communities or good management practice. Indeed, there is good evidence that both formal and informal institutions often lag well behind obvious needs for change to achieve better economic, social or environmental outcomes.

The projects organised under this Theme seek to grapple with such problems of institutional inertia and other socio-economic determinants of the viability of savanna communities. A core goal is to provide information with the sort of content, organisation and presentation that optimises its usefulness for regional decision-makers and policy-makers in Government.

This task is challenging in the savannas because critical information is often sparse, and human populations are small and dispersed and value different attributes of the landscape. To meet this challenge, the Tropical Savannas CRC's regional planning and management program is also diverse. In addition to generating some entirely new information, an important focus is to make better use of existing information, through novel syntheses.

Progress

The Theme 3 program comprises four components. They can be summarised as:

- the status and dynamics of regional communities and economies and the dominant influences on them.
- options for diversifying regional economies.
- regional plans for natural resource management.
- enhanced application of knowledge held by the community and agencies to local and regional management.

Regional dynamics

Project 3.3.4: Understanding outback livelihoods—identifying and linking key social and economic issues affecting the viability of outback regions; and

Project 3.3.7: Predicting regional and landscape dynamics—Leader: Dr Rolf Gerritsen, NT Department of the Chief Minister.

These two projects are carried out in conjunction with the Desert Knowledge CRC. They seek basic understanding of the ways in which remote communities in the rangelands, including the tropical savannas,

differ from rural and urban communities elsewhere. An important long-term goal is to understand how external pressures and local or regional policy interventions might influence their dynamics.

In the 2003–04 report for these projects, we raised the need to develop more specific projects within the conceptual frames provided by early work. During the ensuing year, a great deal of has been done in conjunction with the Desert Knowledge CRC to consolidate arrangements. This has led to the joining of the Outback Livelihoods and Regional Dynamics projects under the leadership of Dr Rolf Gerritsen, a senior economic policy adviser in the Northern Territory Department of the Chief Minister. The broad goals of the project as revised are to:

- Improve understanding of the cultural, social and economic issues affecting outback communities and their linkages with ecological issues.
- Provide products and processes to assist community discourse and decision making on alternative futures and investment priorities.
- Use the key insights from this understanding to better inform regional policy and processes in the three north Australian jurisdictions
- Develop social and economic indicators of regional health and socio-economic resilience to complement existing ecological indicators.

These issues are being addressed in part through a number of case studies, namely:

1. Upper Burdekin, Queensland—Planning for healthy country
2. Anmatjere, Northern Territory—Employment and well-being
3. Ngukkur, Northern Territory—Innovative service delivery
4. Wiluna, Western Australia—People and mining.

The Upper Burdekin and Anmatjere studies are well advanced in documenting and analysing community perspectives. The Ngukkur study has begun with recruitment of a doctoral student, and the Wiluna study will begin shortly.

By providing a framework for integration of a wide range of activity, the project is playing an important role in aligning existing work and processes for understanding the status and dynamics of regional communities. For example, work on alignment of administrative and reporting boundaries in the Northern Territory Government has been used to encourage adjustment of boundaries used by the Australian Bureau of Statistics. This should allow much more focused analysis of a wider range of social indicators (health, crime, employment, housing, infrastructure, economic activity) and at spatial scales regarded as relevant by communities themselves. In the life of the project, efforts will be made to encourage similar re-alignments in the other jurisdictions.

Concurrently, work has begun on developing a ‘typology’ of savanna communities based on variation in socio-economic and cultural features and drivers of viability and resilience. Preliminary work is underway through collaborators in James Cook University regarding local benefits (multipliers) realised through economic activity of various sorts.

Dr John Taylor, from the Centre for Aboriginal Economic Policy Research at the Australian National University, is also engaged in a study *Scoping demographic research in the Australian desert and tropical savannas*. This component of the *Predicting Regional and Landscape Dynamics Project* began in mid-2004 and is the first step in gaining a comprehensive understanding of the characteristics and demographic processes and spatial behaviour of Indigenous and non-Indigenous populations. This study provides some important products, including:

- A demographic database for selected spatial units in desert and tropical Australia.
- Analysis of trends in population counts, estimates and demographic composition for selected spatial units.
- Identification of key demographic indicators.
- Development of enhanced methods for demographic analysis of remote mobile populations.
- Identification of appropriate geographic classifications for demographic analysis.

Progress was in line with milestones, and a final report is expected in September 2005, which will provide important input to design and analysis of other components of the theme.

In the aggregate, the work is expected to provide a much more realistic view of savanna communities and to provide Government and communities with the knowledge and tools they need to assess the likely impacts of various investment decisions or other policy interventions. Although less ambitious in regard to development of predictive capability than initial plans, the revised directions are expected to provide a practical base for assessing both the economic benefits and social gains from regional development initiatives. Linkage to environmental outcomes remains a goal, which will be pursued when relevant components of these economic and social programs are further advanced.

Diversifying regional economies

This area of work has been grouped within a single project examining options for more diverse uses of savanna landscapes and the barriers to moving beyond the orthodox. It examines options for multiple uses of landscapes.

Project 3.3.6: Multiple use in savanna regions—Leader Dr Tim Lynam, CSIRO Sustainable Ecosystems, Townsville

This project was originally designed to develop a framework for examining options for multiple uses of savanna landscapes and analysing the tradeoffs or synergies that may result from diversification of use. Work was organised into a number of activities:

- development of a conceptual framework for considering the costs and benefits of multiple use
- analysis of institutional issues (including property rights and rights of access to natural resources)

These were to be informed by sectorally focused studies. In the 2003–04 report we noted that progress had been patchy due to difficulties in identifying and accessing informative case studies. As a consequence proposed mining and ‘return to country’ studies were dropped, and new studies based around water allocation, pricing and use developed. This shift in direction has yet to be endorsed by TS–CRC management, but offers a potentially productive focus for studies of institutional influences on resource use in an area of strong federal, state and territory policy interest.

Studies on community benefits from tourism are mostly complete. They have provided methods and a framework to assess costs and benefits from regional tourism activity. The work shows that in small isolated communities, costs of servicing some classes of tourists may constitute a large proportion of the putative benefits. They suggest guidelines for tourism agencies in promotion and management to maximise benefits to regional communities from tourism. Three reports were produced by the project team over the past year and can be downloaded from the TS–CRC website at

http://savanna.cdu.edu.au/publications/books_reports/tourism_reports.html

The reports look at independent travellers in the Kimberley, the costs and benefits of tourism in the Carpentaria Shire and the relationship between landowners and tour operators in the Kimberley.

Development of a broad conceptual framework for understanding and analysing multiple use of savanna lands was de-emphasised as a distinct activity. It is thought that generalisations will most clearly emerge from a synthesis of the case studies and better understanding of institutional issues. Effort previously directed at the framework was reallocated to an examination of indicators of wellbeing and their linkage to issues associated with access to land and the condition of land and resources.

Research outputs from the project include two major savanna workshops—on property rights and multiple land use—organised by the (then) project leader in 2004–05, Dr Romy Greiner. Dr Greiner left CSIRO to form a private consultancy group, and has now been replaced by Dr Tim Lynam. Papers from these workshops are being prepared for publication.

Regional planning

A recent discussion paper (DAFF 2002) noted: “There is increasing recognition that sustainably managing Australia’s natural resources requires regionally based approaches that addresses issues in an integrated way.” In recent years in Australia, and globally, there has been increased emphasis on regional approaches to natural resource management as well as many social and economic policies.

Regional planning systems have a high potential to contribute to sustainable development by integrating economic, social and environmental policies in a spatial context. Many of the issues of natural resource management such as sustainable use of natural resources, water quality, biodiversity and the can be best measured and addressed technically at a regional scale—within river basins, biogeographic regions and production zones. Regions can provide for improved integration of politics and administration needed to balance the economic, social and ecological dimensions of development. Finally, there is a need to decentralise decisions closer to the local community to enhance NRM activity at the property and local scales and to facilitate more open participatory decision making processes.

These projects examine issues affecting capacity to make competent plans for improve resourced management and the associated opportunities for residents of remote regions to genuinely influence outcomes to improve management performance.

Project 3.1.6: Regional planning in the Northern Territory—Leader: Professor Geoff McDonald, CSIRO Sustainable Ecosystems, St Lucia, Brisbane

The project goal is to “provide options for regional planning and management policy ... for consideration by the NT Government”. A draft report was delivered in April 2004. During 2004–05 a report and summary of the most important conclusions were examined by members of the Project Reference Group, comprising chiefly agency personnel. A core issue identified by the review was the need for much better linkages between regional NRM and economic development planning.

Work on this project is mostly complete, but there are proposals to link this study to a policy forum sponsored by the TS–CRC on regional planning issues. The Northern Territory Government recently reorganised the way it seeks to deliver regional development opportunities, and such a forum may provide timely input to processes for better-linked delivery of NRM and social development initiatives.

Project 3.3.5: Healthy savanna planning systems—Leader: Professor Geoff McDonald, CSIRO Sustainable Ecosystems, St Lucia, Brisbane

The main aim of the project is to contribute to improving regional NRM planning and implementation processes in Australia’s tropical savannas. The project builds and applies long-term, regionally focused monitoring, evaluation and improvement frameworks for regional planning arrangements and plans. Frameworks are being designed in partnership with regional NRM organisations and agencies across Queensland, the Northern Territory and Western Australia, with the purpose of capturing and sharing lessons to support adaptive management at the regional and state or territory scales. The project builds on evaluation frameworks designed in earlier foundation regional planning projects (Projects 3.2.2 and 3.2.1).

The project team applied criteria designed specifically to evaluate regional NRM planning arrangements and plans to benchmark the progress made in savanna regions. The key findings were summarised in an April 2005 Benchmark Report, based on 53 interviews with planners and agency staff, participant observation of regional NRM fora and the review of regional NRM plans. (Download from the TS–CRC website at <http://savanna.cdu.edu.au/publications/books_reports/natural_resource_ma.html>)

The benchmark report outlined the critical constraints faced by planners and managers in establishing planning arrangements and evaluates the effectiveness and adequacy of state and regional level responses to the related challenges. Finally, future directions are outlined to foster improved planning practice, policy and program design and delivery, and more constructive NRM partnerships.

The project team assisted Queensland’s Northern Gulf Resource Management Group (NGRMG) prepare its regional NRM plan and project team members also contributed to the development of the Integrated Natural Resource Management Plan for the Northern Territory, in cooperation with the Landcare Council of the NT and DNRETA planning team in late 2004.

The project’s adoption strategy relies on ongoing working relationships with research partners and participants (e.g. regional NRM bodies, government agencies, NRM stakeholder organisations etc). Continuing adoption strategies involve:

- Maintaining regular (six-monthly) progress reports and in-progress findings to the Queensland Regional NRM Groups Collective. The team has designed a process to step through the findings and workshop critical issues arising from the first benchmark report, using a self-directed learning process
- Regular in-progress findings reported to state government agency Regional Coordination Groups, particularly in northern and central regions of Queensland;

- ‘Participation agreements’ negotiated with stakeholders and key sectors, including with Queensland Farmers Federation
- Regional planners workshop held in Brisbane, 9 March 2005, to share lessons and experiences between (16) regional NRM planners and consultants engaged in NRM plan development from Queensland, the Northern Territory and Western Australia. This was supported by the preparation and distribution of a ‘Trigger paper’ to workshop participants drawing on the findings of the 2005 review of accredited regional NRM plans. A workshop report was finalised in May 2005, highlighting planners’ experiences. A second product from the workshop will be the preparation of a short briefing paper to Queensland State Government on recommendations for the future design of regional NRM planning guidelines.
- Communicating with professional institutions for planning and environment e.g. recent presentation to the Planning Institute of Australia’s National Congress, April 18, 2005, Melbourne—*Regional natural resource planning in Northern Australia: Progress, challenges & prospects*, Healthy Planning Systems project, Tropical Savannas CRC.
- An invited submission to the Australian Government’s Regional Implementation Working Group in 2004.
- Based on the key findings of the April 2005 benchmark report, a submission was prepared to the Queensland Government’s Green Paper on the future of regional planning arrangements in Queensland, during May 2005.

The second major adoption strategy involves conducting several discrete case studies within the project during 2005–06. Although informed by the key findings or emerging issues from the Benchmark report, these case studies will be co-developed with relevant savanna stakeholders. Each study will seek to involve at least two regions across the savannas, with a focus on lesson sharing and application of research outcomes.

Knowledge building

This area comprises a small group of sub-projects done in close collaboration with savanna resource managers. Studies are based around application of Bayesian Belief Networks to elicit, record and apply knowledge to pressing issues in savanna resource management. The particular approach is well established in a number of disciplines, but the technical details are perhaps less important than the associated process of close engagement of researchers with resource managers. The effort required for participants to articulate and position knowledge and understanding in relation to agreed objectives increases the effectiveness of communication and, ultimately, management capability. In addition to their own research outputs, the projects provide tools used for application of knowledge gained in other components of the TS–CRC program.

Project 3.1.3: Integrating knowledge and management at property and regional scales through participatory knowledge-building—Leader: Professor Ockie Bosch

The project develops tools and processes for:

- gathering different forms/sources of knowledge about natural resource management (NRM) objectives and how they can be achieved and
- institutionalising the adaptive management process as a mechanism for ongoing knowledge building.

Achievements during 2004–05 included:

Decision support tools

- An internet-based decision support tool was deployed in June 2005 for displaying and using Bayesian Belief Network models. The tool allows BBN models developed under this and other projects to be used online. Future effort will focus on encouraging use of the tool in conjunction with discussion forums on the CRC website to encourage exchange of knowledge among users and to gather feedback for enhancing the models.

Fire management on Queensland parks and reserves

- This case study is now complete. Workshops were held with Queensland Parks & Wildlife Service (QPWS) rangers and staff during 2004 to identify the critical success factors for adaptive fire

management and their dependencies. The workshop results were used to develop BBN models for fire management planning, implementation and monitoring/reporting in national parks. In February 2005, a survey was conducted of 28 rangers in charge of national parks in the savanna and Cape York/dry tropics districts of Queensland. The survey results were used to populate the BBN models and a subsequent sensitivity analysis was used to identify key institutional obstacles to effective implementation of fire management plans.

- In June 2005, QPWS staff had access to training in use of the models. Presentations of the outputs of the case study were made to QPWS Directors in the North Queensland Region and EPA Executive Directors in Brisbane. Both Regional and Executive Directors provided favourable feedback and expressed interest in the ongoing use of the case study outputs. A publication is currently being written to describe the process used to develop the models and the results obtained.
- The most important outcome of the work was the engagement of staff at all levels in a major research user organisation to examine and overcome obstacles to effective application of knowledge and skills in fire management.

Northern Gulf Case Study

Land Condition Component

During 2004, workshops were held with researchers, graziers and agency staff to develop BBN models that capture factors believed to influence land condition management objectives at a site or within a paddock. A summary of the workshop compared the differences between grazier and researcher models. Current activity includes populating the models with available data or probability estimates and reconciling differences between the grazier and researcher models.

It is anticipated that making the models available online will encourage exchanges among researchers and graziers that improve understanding of the factors that most influence decision-making and that warrant additional dialogue and study.

A workshop was also conducted with weed researchers to explore options for application of BBN methods to risk assessment and other issues associated with weed management (Theme 1).

Regional Planning Component

This case study is now complete. Workshops were held with the Northern Gulf Regional Management Group during 2004 to identify the critical success factors leading to the Management Action Targets (MATs) and Resource Condition Targets (RCTs) for Pasture Health stated in their draft regional NRM plan. Participants developed a BBN model outlining the pathways to achieving targets. This model was subsequently populated by the NGRMG with probability estimates to assess pathways and their relative risk.

Some training and guidelines for developing BBN models was offered to the NGRMG coordinator and, since the completion of the Pasture Health Model, the NGRMG have themselves developed BBN models for MATs and RCTs in all remaining themes in their regional NRM plan. In December 2004, the coordinator of the NGRMG presented the models to the Joint Steering Committee for regional NRM planning in Queensland. Positive feedback was obtained from the committee and the NGRMG have since used the models to support their Regional investment strategy. This was a good adoption outcome, in that a remote regional body has developed the capacity to systematically record and synthesise knowledge held within the regional community and to direct investments to areas of priority in a remote regional setting. A publication outlining the methods used in the case study and results obtained has been submitted to the *Journal of Environmental Planning and Management*.

Highlights and challenges

The theme comprises a number of ambitious projects, all focused on making information more useful to decision makers and those engaged in planning at a range of spatial scales and over a number of sectors. During 2004–05 much effort went into building individual projects that are achievable with the resources available, yet contribute to the broader conceptual frame laid out in earlier studies and reports.

Highlights included:

- Completion of tourism case studies within the multiple use project, providing insights to the level of benefits extracted by local communities and ways of improving benefits.
- Release of an online knowledge-building tool in conjunction with decision-support models for natural resource management.
- Application of criteria or evaluation of regional planning performance to a number of regional plans, including joint assessment of performance with regional planners.
- Re-design and expansion of the Outback Livelihoods and Regional Dynamics projects.
- Increased integration of TS–CRC research with activities of the Northern Territory Government in regional development.

Future directions

Attention will be given to opportunities to extend application of lessons from the Knowledge Building work to a wider range of TS–CRC research, as an important contribution to effective adoption of research outputs.

With the consolidation of the Outback Livelihoods and Regional Dynamics projects, options will be explored to increase linkage of analysis of socioeconomic impacts of investments or other policy interventions in regional communities to assessment of environmental impacts.

Greater efforts will also be made to engage Government more closely in CRC work in both Queensland and Western Australia.

THEME 4 HUMAN CAPABILITY DEVELOPMENT

Leaders: Dr Peter Jacklyn, TS–CRC, Darwin; Mr Joe Morrison, NAILSMA, Darwin

Summary

This theme focuses on developing the capacity of people and communities so that research findings and local knowledge can be more effectively used in land management in the tropical savannas. This is a particularly important role in northern Australia where capacities to inform research and to use research are often low. In 2004–05, the projects in this theme made great progress and saw significant contributions to the capacity of savanna land managers to engage in effective land management.

Capacity building activities in this theme include working with communities to help them conserve and pass on local knowledge (*Indigenous capacity building project*) and providing communities and enterprises with tools and information that enhances their NRM capacity (*Communication resources project*). Importantly, this capacity building focuses on specific NRM activities and user groups associated with the TS–CRC’s participative projects so that it is more likely to result in actual improvement in NRM outcomes.

Because of the great diversity of stakeholders involved in managing the tropical savannas, equipping future researchers to better engage with, and meet the research needs of these stakeholders is also a priority and is the focus of the project on higher education.

Promotion of the Centre’s activities and outputs and enhancing communication between Centre staff (*Communication resources project*) and raising awareness of tropical savannas issues (*Tropical savannas knowledge in schools project*) are also key roles played by this theme.

The program comprises the following projects and their leaders.

Higher education—Leader: Dr Penny Wurm, CDU

Accreditation documents for the Professional Doctorate in Tropical Environmental Management received enthusiastic in-principle support from key staff at CDU, UQ and JCU. They are now being considered at executive level at the three universities with the aim of the program beginning in 2006, if accredited.

Development of a new education unit for undergraduates, *Fire ecology and management in northern Australia*, was largely completed in 2004–05. It is based upon collaboration between the TS–CRC and the Bushfire CRC. The materials will be presented on a CD and made available for use at partner universities in the two CRCs.

Master of Tropical Environmental Management enrolments were maintained and the projects continued to provide a forum for collaborations and innovative research activities for trainee researchers. External co-supervisors for MTEM projects in 2004–05 were based at NT DNRETA, Queensland Parks & Wildlife Service, Australian National University, as well as three schools at CDU. Project examiners were drawn from JCU, the Northern Land Council, NT DNRETA, Ecobytes Consulting, and four schools within CDU.

The TS–CRC has 27 current research students who are supported with full scholarships or top-up scholarships and all receive operational costs. Two students submitted their theses in 2004–05. PhD graduates and students continued to secure employment in the savannas.

A full summary of the TS–CRC’s Education program begins [p. 48](#).

Communication resources for the tropical savannas—Leader: Dr Peter Jacklyn, TS–CRC

This project develops tools, websites, workshops and publications that help build capacity and enhance adoption of NRM research, enhance collaborative research, and increase awareness of the Centre and savanna issues.

Highlights in 2004–05 were:

- The *North Australian Fire Information* website was increasingly used by northern fire managers to become the standard website for fire managers across most of north Australia (from feedback from various sources and the North Australian Fire Manager’s Forums).

- More than 1850 publications on the tropical savannas including were sold—a significant increase on 2003–04.
- Collaborative research was fostered by the newsletters *Savanna Links* and *Topical Savannas* and support for numerous workshops.
- The Centre’s website with an average of 25,000 web-page visits a week continued to play a major role in publishing the CRC’s research and raising awareness of savanna NRM issues.

See also the sections on Technology Transfer and Utilisation, Collaboration and Communication Strategy.

Tropical Savannas knowledge for schools—Leader: Ms. Julie Crough, TS–CRC

This project will provide curriculum support resources and materials that enhance and improve the understanding of Australia’s tropical savannas. The project involves TS–CRC (its partners) and the following education providers.

- Northern Territory Department of Employment, Education and Training (NT DEET), teachers and schools to develop a comprehensive and interactive website about Tropical Savannas Knowledge that links with the Northern Territory Curriculum Framework, VET modules and Stage 1 and 2 SSABSA courses.
- Education Queensland to develop a collaborative effort to produce curriculum support materials according to identified needs.
- Department of Education and Training, Western Australia to develop a collaborative effort to produce curriculum support materials according to identified needs.

Considerable progress was made in 2004–05:

- The *EnviroNorth* website will be home to the learner-centred, issues-based modules with teams of teachers developing the designs. Two of these learning modules—*Biodiversity* and *Cattle Country*—are close to completion. Each module, both during and at the end of the design phase, will be sent to TS–CRC stakeholders for review. After the review process, these designs will be outsourced to multimedia educational design specialists.
- A register of the Who’s Who of the Tropical Savannas for teachers and students (for the NT) is almost completed and will be integrated in the website.
- Links were established with Associate Professor Neil Anderson (Deputy Head, School of Education, at James Cook University) to expand the project to Queensland by linking with the Far Northern Districts Consortium of Schools. It is planned to further this stage of the project after the review phase of the first two learning designs.
- Ongoing promotion of the website is occurring through the established community of research users including the Reference Group and the Teacher Focus Group. Further, teachers involved in the Teacher Focus Group are planning units of work for their classes that will use the new website. It is hoped that these teachers will be champions for the project in their respective school clusters.

Indigenous capacity building—Leader: Mr Joe Morrison, TS–CRC

This project aims to improve coordination, collaboration and collegial engagement between Indigenous land managers and owners and the TS–CRC, its partners and current and future projects. It aims to do this by hosting an annual land and sea management policy forum a regionally based Indigenous leadership forum targeting aspiring Indigenous land managers and owners. The project also supports the development of Indigenous land and sea management across the savannas by linking Indigenous people with other groups engaged in land management in the region. This project is greatly enhanced by Joe Morrison’s joint roles of Co-Theme Leader with the TS–CRC and as the coordinator of the North Australian Indigenous Land and Sea Manager’s Alliance (NAILSMA).

During the year the project and NAILSMA hosted its first forum at Wynbarr Waterhole on Menggen Aboriginal Land Trust, west of Katherine in the Northern Territory, which is owned by the Wardaman people. Around 200 Traditional Owners from across the north attended the forum. The forum discussed the alliance, and then provided input into the future development and management of the Indigenous estate. The first edition of *Kantri Laif*, a bi-annual magazine dedicated to Indigenous land and sea management issues,

was published and 2800 copies were distributed across north Australia. There were a number of important articles where Indigenous people talked about their activities and aspirations on their country.

Dugong and Marine Turtle Management Project — Leader: Dr Rod Kennett, CDU, Darwin

The Dugong and Marine Turtle Management Project, led by Dr Rod Kennett, also began in late January 2005 with funding of \$3.8 million over 2.5 years. The project aims to develop long-term collaborative strategies and community-based programs for the conservation and management of dugong and marine turtles across northern Australia. It is a joint initiative between NAILSMA and the TS-CRC. The initial phase of the project involved the development of Regional Action Plans by three NAILSMA members (Kimberley Land Council, Northern Land Council and Balkanu Cape York Land Council) together with two partner organisations (Carpentaria Land Council Aboriginal Corporation and Torres Strait Regional Authority). These plans will form the basis for on-ground activity in these five regions over the next two years. Over-arching cross-regional projects will also be initiated.

Steven Johnson is developing a north Australian Indigenous Knowledge Strategy that will impact on the Indigenous Ecological Knowledge project in the coming year. For information on the project's progress this year, see Theme 2, page 34.

Other areas supervised by Joe Morrison this year included Lisa Binge's (NAILSMA Communication Officer) leadership, scholarship and communication functions, and Indigenous components of the north Australian knowledge-based fire project, led by Mr Wayne Davis. Unfortunately Wayne had to return to his country in central Australia, but had set the scene and supported many initiatives of the fire project over the past 12 months. Importantly the last 12 months saw the development of a closer working relationship between NAILSMA and The Christensen Fund who have been supportive of the aspirations of Indigenous people across northern Australia.

Education and training

Summary

The project provides postgraduate research and course programs, with the aim of building the capability of people working on and managing land in the tropical savannas. Activities include support for selected undergraduate programs, with the aim of improving access to subsequent postgraduate study.

Project objectives are:

- To build capability by providing relevant, current and excellent education programs focussing on tropical savannas management.
- To provide structures (postgraduate courses) through which research outcomes can be communicated directly with stakeholders in that research (students).
- To increase opportunities for collaboration and links between tertiary education institutions in the region, and outside the region, and among the people working within them.
- To ensure excellence in all project outcomes through ongoing evaluation.

The Higher Education Project is central to the TS-CRC achieving its overall objectives, including Key Result Area 4, namely productive and capable people living and working in the tropical savannas.

Project activities this year focused on:

- Preparation and submission of accreditation documents for the Doctorate in Tropical Environmental Management at all three partner universities.
- Ongoing activities with the postgraduate coursework program in Tropical Environmental Management, at Charles Darwin University, James Cook University and now the University of Queensland.
- Ongoing support and training of new Higher Degree by Research (HDR) students, at three partner universities.
- Planning and completion of a new advanced undergraduate unit in *Fire ecology & management in northern Australia*, in collaboration with the Bushfire CRC.
- Ongoing technology transfer with a new education partner in Indonesia, Satya Wacana Christian University.

Progress

Professional Doctorate in Tropical Environmental Management: Accreditation documents for this new program have been submitted for consideration at CDU, JCU and UQ. Features of the course will be:

- Research portfolio which includes a Professional Placement
- Discipline streams, rather than core units, in the course-work component
- Compulsory requirement to undertake some course-work at the other two partner universities during candidature

The proposal was well received at the level of the Dean of Graduate Studies at CDU and JCU, and the Faculty Executive at UQ, who also provided valuable advice and assistance in the preparation of the accreditation documents.

The accreditation documents are now being considered at executive level at all three universities, with the aim of the program beginning in 2006, if accredited.

Fire ecology and management in northern Australia: This exciting new education project is based upon collaboration between the Tropical Savannas CRC and the Bushfire CRC. The materials will be presented on a CD and made available for use at partner universities in the two CRCs, and include:

- Website text, diagrams and images.

- Comprehensive reading lists.
- Links to key internet resources.
- Video clips.
- Activities aimed to encourage understanding of topics beyond the introductory text.
- Assessment items—activities which are recommended as assessment items.

Higher Degree by Research students: The TS–CRC has 27 current research students (Table 4). TS–CRC higher degree by research students are supported with full scholarships (n = 1), top-up scholarships (n = 26), and all students receive up to \$5,000 per year of candidature for operational costs.

Training for Higher Degree by Research students: In September 2004, TS–CRC research postgraduate students attended a week of activities in Darwin, which included participating the TS CRC annual meeting. The week commenced with two-day communication skills workshop, presented by Susan Templeman of Templeman Consulting, followed by two days of TS–CRC presentations and workshops, and concluded with a two-day popular writing workshop, presented by Peter Spinks. Feedback from students indicated this week was a success, but possibly too long. The TS–CRC will continue to offer research student workshops each year, as they assist students integrate into the TS–CRC network, ensuring improved uptake of their research and employment prospects.

PhDs submitted or awarded: Two students funded under Round 1 of the TS–CRC submitted their theses in this financial year. Anthea Dee submitted her thesis entitled *Seasonal habitat use, food resources and Aboriginal perceptions of the feral pig *Sus scrofa* in the Arafura swamp* at Australian National University. Zhang Yue submitted and lodged his PhD thesis entitled *Spatial patterning of resources for granivores—developing a model for habitat management* at CDU. Dr Zhang is now employed by NT DNRETA, Alice Springs.

A number of students recruited in Round 2 of the TS–CRC plan to submit their theses in the next financial year.

Tropical Environmental Management (TEM) coursework program: Ongoing TS–CRC duties associated with the TEM Project Coordination included:

- targeted marketing of the TEM program (especially among TS–CRC partners via a bi-annual mail-out).
- maintenance of course website, and related marketing materials.
- promotion and management of cross-institutional enrolments at JCU (and now UQ) for students in the TEM program at CDU.
- coordination of MTEM Research Project students.

TEM enrolments are satisfactory, and stable. TEM completions remained relatively stable since 1998.

TEMsLinks is a newsletter that is produced two to three times per year and sent to all TEM students, graduates, and teaching staff. The purpose of the newsletter is to (a) help external students connect with other students, the university and TS–CRC, (b) to foster an alumni of graduates, and (c) to promote the course. Comments from past, present and prospective students have been very favourable. Hard copies are posted to current students and recent graduates and copies are also available on the TS–CRC website <http://savanna.cdu.edu.au/education/tems_newsletter.html>.

Master of TEM projects continue to provide a forum for collaborations and innovative research activities for trainee researchers. External co-supervisors for MTEM projects in the 2004–05 were based at NT DNRETA, QPWS, ANU, as well three Schools at CDU. Project examiners were drawn from JCU, Northern Land Council, NT DNRETA, Ecobytes Consulting, and four Schools within CDU.

Highlights and challenges

Enthusiastic in-principle support from key staff at CDU, UQ and JCU for the professional doctorate, and the completion of an exciting new unit in *Fire ecology and management in northern Australia* were highlights of the year. Both these projects involved productive collaborations among TS CRC staff, university staff and researchers.

TS–CRC PhD graduates and students continue to secure employment in the savannas. A complete listing of the employment destinations of TS–CRC supported PhD student please see Table 5.

Future directions

Project activities in the coming financial year will include:

- Research into the effectiveness of the TEM program for graduates.
- Establishment of inter-agency secondments for the Professional Placement in the Doctorate of TEM (if accredited) will be negotiated among TS–CRC agency partners.
- Assisting university partners with the accreditation of *Fire ecology and management in northern Australia*.
- Securing external funding for ongoing collaborations with Indonesian partners for the development of savanna education resources for postgraduate study in eastern Indonesia.
- Ongoing professional development for higher degree by research students.
- Ongoing support and maintenance for the TEM program.

Table 4 PhD Students

Student	Project Title	Uni	Supervisors	Start	Funding
Jenny Brazier	Fate of heavy metal contaminants from Rum Jungle uranium mine into the Finiss River, NT, Australia	CDU	D Parry (CDU) N Munksgaard (CDU) H Heijnis (ANSTO) A Bollhoefer (ERISS)	2004	TS–CRC CDU
Kristine Brooks	Evaluating exotic grass management in terms of native vegetation restoration	CDU	S Setterfield (CDU) M Douglas (CDU) B Grace (NT DNRETA)	2004	TS–CRC CDU
Caroline Chong	Regeneration dynamics in a disturbance-prone landscape: population genetics and ecology of tropical riparian <i>Melaleuca</i>	JCU	M Waycott (JCU) W Edwards (JCU) R Pearson (JCU) G Morgan (QEPA)	2004	TS–CRC JCU (Australian Centre for Tropical Freshwater Research)
Nicole Cranston	The effectiveness of riparian fencing for biodiversity conservation	CDU	M Douglas (CDU) S Setterfield (CDU) A Fisher (NT DNRETA)	2003	TS–CRC CDU Victoria River District Conservation Assocn
*Philip Douglas	Predicting outcomes of savanna management	JCU	R Thwaites (JCU) J Ludwig (CSIRO)	2003	JCU
Leasia Felderhof	Fire management in Queensland's North West Highlands	JCU	D Gillieson (JCU) G Cook (CSIRO)	2003	TS–CRC Ergon Energy QPWS
Ron Firth	Ecology and conservation status of the brush-tailed rabbit-rat (<i>Conilurus penicillatus</i>)	CDU	R Noske (CDU) P Whitehead (CDU) T Griffiths (CDU) J Woinarski (NT DNRETA)	2001	TS–CRC
John Guenther	VET as a tool for regional planning and management in savanna communities	CDU	I Falk (CDU) A Arnott (CDU) G Ramsay (ICAT)	2003	TS–CRC CDU

Table 4 PhD Students

Student	Project Title	Uni	Supervisors	Start	Funding
Christopher Holloway	Hierarchy, distribution and spatial utilisation of patches by cattle in a semi-arid tropical savanna	JCU	D Gillieson (JCU) P Valentine (JCU) P O'Reagain (QDPIF) I Gordon (CSIRO)	2004	TS-CRC JCU QDPIF
Marilyn-Joy Hubner##	Cross-cultural exchange of Indigenous knowledge	UQ	H Ross (UQ) B Carter (UQ) R Beviss (EA)	2003	TS-CRC UQ
Kasper Johansen	A framework for riparian zone mapping over local to regional scales in Australian tropical savannas	UQ	S Phinn (UQ) M Douglas (CDU) J Lowry (ERISS)	2004	TS-CRC UQ
Steve Johnson	Culture as process: Correlativity, contest and tourism on Yanyuwa country	UQ	J Bradley (UQ) D Hafner (UQ) P Cooke (NLC)	2001	TS-CRC UQ
Jason Jones #	Bioregional planning for biodiversity conservation in the tropical savannas of northern Australia	UQ	C McAlpine (UQ) A Peterson (UQ) G McDonald (CSE) J Woinarski (NT DNRETA)	2004	TS-CRC UQ withdrawn
Allyson Lankester*	Social investigation into the knowledge and management practices of riparian areas by landholders in the upper Burdekin catchment region	JCU	P Valentine (JCU) M Fenton (JCU) R Landsberg (Trafalgar Station)	2004	TS-CRC JCU (Aust. Centre for Tropical Freshwater Research) LWA
Jenny Moffatt	Graziers' perceptions of sustainable development and what this means for policy	UQ	H Ross (UQ) G Lawrence (UQ) J Taylor (Rangelands Australia)	2001	TS-CRC UQ
Gillian McCloskey	Assessment of riparian zone stability from a geomorphological perspective in the Victoria River District	CDU	G Boggs (CDU) M Douglas (CDU) B Wasson (CDU) J Ludwig (CSIRO)	2004	TS-CRC CDU CSIRO

Table 4 PhD Students cont.

Student	Project Title	Uni	Supervisors	Start	Funding
Carol Palmer#	Assessment of the conservation status and management requirements for four critical weight range mammals in the mid/north Kimberley region of WA	CDU	B Brook (CDU) J Woinarski (NT DNRETA)	2003	TS–CRC CDU
Lionel Pero	Combining theory with practice: Case study lessons and insights for improving community-based regional NRM group decision making	UQ	G McDonald (UQ/CSIRO) T Smith (CSIRO) C McAlpine (UQ) P Lawrence (QDNR&M)	2003	TS–CRC UQ
Aaron Petty	The historical and cultural context of landscape change within the South Alligator River system, Kakadu National Park	UC Davis	B Orlove (UC Davis) M Douglas (CDU) D Bowman (CDU) R Kennett (KNP)	2004	TS–CRC National Science Foundation Pacific Rim Grant CDU
Elizabeth Poon	Nutrient distribution and landscape function in grazed and ungrazed semi-arid savanna, north Queensland	UQ	S Schmidt (UQ) H Possingham (UQ) J Ludwig (CSIRO SE)	2003	TS–CRC UQ
Sarah Sheehan	The interactions between grazing and the spread of invasive aquatic grasses	JCU	R Congdon (JCU) P Williams (QPWS)	2004	TS–CRC JCU Smart state Grant
Euan Ritchie	The macro-ecology and conservation status of the antilopine wallaroo (<i>Macropus antilopinus</i>)	JCU	C Johnson (JCU) A Krockenberger (JCU) S Garnett (QEPA)	2002	TS–CRC Australia and Pacific Science Foundation Australian Geographic Cape York Peninsula Development Association JCU

Table 4 PhD Students cont.

Student	Project Title	Uni	Supervisors	Start	Funding
Natalie Rossiter	The impact of invasive grasses on ecosystem processes in Australia's savannas	CDU	M Douglas (CDU) S Setterfield (CDU) L Hutley (CDU) G Cook (CSIRO)	2003	TS–CRC CDU CSIRO
Kathy Seton	' <i>Li-Yanyuwa li-nhanawaya li-murndangumara</i> ' Yanyuwa women, land rights and relations to country	UQ	J Bradley (UQ) D Hyndman (UQ) B Hocking (QUT) P Cooke (Northern Land Council)	2001	TS–CRC UQ
Colin Trainor	Responses of wildlife to environmental variation and land use in Lautern District, Timor-Leste (East Timor)	CDU	R Noske (CDU) J Woinarski (NT DNRETA)	2003	TS–CRC CDU UK Parrot Society BirdsLife International
Leonie Valentine	Impacts of burning for weed management on bird and reptile assemblages in grazed open woodlands	JCU	C Johnson (JCU) L Schwarzkopf (JCU) T Grice (CSIRO SE) J Ludwig (CSIRO)	2003	TS–CRC Birds Australia JCU Normal Wettonhall Award
Adele Vagg	Integrating on-ground actions that contribute to regional and property goals for sustainable land management	UQ	O Bosch (UQ) H Ross (UQ) D Walker (CSIRO)	2001	TS–CRC UQ
Annemarie van Doorn	Ecology, conservation and management of purple-crowned fairy-wren in the Victoria River District	Uni. of Florida	B Brook (CDU) J Woinarski (NT DNRETA)	2001	TS–CRC University of Florida VRD Conservation Association KCT

Table 4 PhD Students cont.

Student	Project Title	Uni	Supervisors	Start	Funding
Michelle Watson	Faunal responses to alteration in plant community structure in tropical savannas	CDU	P Whitehead (CDU) J Woinarski (NT DNRETA)	2001	TS-CRC
Katherine Witt (nee Taylor) ##	Rights and responsibilities in land ownership and natural resource management	UQ	W Carter (UQ) D Cameron (UQ) R Greiner (CSIRO)	2004	TS-CRC UQ
Mark Ziembicki	Ecology and conservation of the Australian bustard <i>Ardeotis australis</i> in northern Australia	University of Adelaide	David Paton (U Adel.) J Woinarski (NT DNRETA)	2002	TS-CRC Uni Adelaide Birds Australia Aust Birds Foundation Wildlife Conservation Fund Herman Slade Foundation AFFA Science Award for Young People

* MSc Student

withdrawn to take up employment; ## leave of absence

Table 5 Employment destinations of TS–CRC supported PhD graduates

Student	PhD Project Title	Uni	Employment
G. Calvert	Effects of grazing on plant biodiversity in the Dalrymple Shire	JCU	Consultant, Earthworks Environmental Services, Townsville
F. Fraser	The ecology of the Partridge Pigeon and habitat impacts due to fire and grazing	CDU	Weeds & wetlands Project Officer NLC, Darwin
W. Hillman	Ecotourism in northern Australia—interpretive guided tours	JCU	Tutor at JCU
B. Hoffman	Responses of ant communities to land-use impacts in northern semi-arid Australia	CDU	Entomology research consultant, Darwin
G. Kelley	Soil properties and plant water use of tropical savannas	CDU	Researcher, University of Western Sydney
A. Kutt	Spatial patterns of distribution, abundance and diversity in the vertebrate fauna assemblages of the Desert Uplands bioregion, northern Queensland	JCU	Research Officer EPA (Qld), Townsville
H. Khwaja	Study of remote sensing and GIS for the assessment of their capabilities in mapping the vegetation form and structure of tropical savannas in northern Australia	CDU	To be advised
C. Macgregor	Achieving sustainable urban communities in the Australian Savanna by ecological planning and community participation	JCU	Bureau of Rural Sciences, then research in UK
C. Menges	The application of radar remote sensing to tropical savannas in the NT	CDU	To be advised
C. Mobbs	Regional resource planning: the potential and limits of adaptive and collaborative models	ANU	Integration Manager, Land & Water Australia, Canberra
K. Pfitzner	The use of remotely sensed data, ancillary data and GIS technologies for the evaluation of the rehabilitation of two mine sites	CDU	Remote sensing Officer with ERISS, Darwin
M. Runcie	The ecology and behaviour of the rock-dwelling possums (<i>Petropseudes dahli</i> and <i>Wyulda squamicaudata</i>)	CDU	Research scientist, CSIRO, then consultant and family responsibilities, Sydney
B. Sharp	The roles of fire and grazing in producing long-term landscape-scale vegetation change in an Australian tropical savanna	Oxford, UK	Researcher with Ministry of Fisheries, NZ
T. Vigilante	An ecological study of the North Kimberley landscape	CDU	Project Officer (land and sea management) with Kimberley Land Council, Derby
G. Whiteman	The impact of livestock grazing on the genetic diversity of the grass <i>Heteropogon contortus</i> in Queensland tropical savannas	JCU	Researcher, CSIRO Sustainable Ecosystems, Alice Springs
C. Xiaoyong	Production, structure and carbon balance of a Eucalyptus open forest in tropical savanna, Northern Australia	CDU	Researcher, Department of Earth and Environmental Science, Okanagan University College, Canada
Y. Zhang		CDU	GIS Officer, NT DIPE, Alice Springs

Table 5 Employment destinations of TS–CRC supported PhD graduates Cont.

Student	PhD Project Title	Uni	Employment
Steve Johnson	Culture as Process: Correlativity, Contest and Tourism on Yanyuwa Country.	UQ	Project Officer, NAILSMA
Jenny Moffatt	Graziers' perceptions of sustainable development and what this means for policy	UQ	Contract position, Research Officer for the Centre for Social Responsibility in Mining which is under the Sustainable Minerals Institute, UQ
Annemarie van Doorn	Ecology, conservation and management of Purple-crowned Fairy-wren in the Victoria River District	Uni. of Florida	Sessional lecturing position, Batchelor Institute for Indigenous Studies
Michelle Watson	Faunal responses to alteration in plant community structure in tropical savannas	CDU	Contract position, Project Officer, various fauna survey consultancies
Mark Ziembicki	Ecology and conservation of the Australian Bustard <i>Ardeotis australis</i> in northern Australia	Uni. of Adelaide	Contract position, Research Officer, School of Resources, Environment & Society, Australian National University and Biodiversity Conservation Unit, NT

Collaboration

The year 2004–05 saw the strong collaborative links built by the TS–CRC continue to be used in its projects with an increasing emphasis on getting project outputs used.

NRM research in north Australia is still profoundly affected by the tyranny of distance. Research groups are often small and isolated from other researchers and from expertise in the larger southern centres (isolated, that is, from the day-to-day personal interactions that electronic communication can build upon). Northern researchers are also often isolated from end-users who are scattered across remote parts of the landscape. The north is one of the most culturally diverse parts of Australia—peopled by pastoralists, aboriginal communities, park rangers, planners and policy makers, researchers etc. who can look at the same landscape in very different ways. This isolation produced by distance and culture hampers the researchers' ability to develop innovative and practical solutions that will be used by land managers.

The TS–CRC aims to break down these barriers by encouraging collaboration between different researchers and between researchers and end-users. The Centre is well placed to do this as its partners comprise most of the NRM research organisations working in the tropical savannas: CSIRO and the universities; and government land management agencies. The partners also include representatives of the main research users: Aboriginal land managers, pastoralists and again land management agencies that employ park rangers etc.

Working with these partners the Centre has established a portfolio of projects that have collaboration at their core. The collaboration takes the following forms.

Collaboration between jurisdictions across northern Australia This allows different areas to learn from each other about common land management challenges. Table 6 shows that most projects have links with agencies that straddle at least two jurisdictions, with many projects having links that connect across all three—Western Australia, the Northern Territory and Queensland.

Collaboration between different industry sectors These include conservation agencies and primary industry agencies which allows practices and strategies that take a whole-of-savannas approach to be developed. For example, Project 2.2.1 *Beef industry best practice*, link conservation and research agencies with primary industry agencies and pastoral companies.

Collaboration with national bodies These are extensive and many draw on the Centre's role as the main umbrella organization for NRM across a major part of the continent. For example, the CRC has major contracts with the Natural Heritage Trust to provide capacity and information on fire management and turtle and dugong management to north Australian land managers; it is contracted to provide information on tropical savanna carbon cycles for the Australian Greenhouse Office; four projects on sustainable grazing management receive funding from Meat and Livestock Australia.

Collaboration with international bodies These continue to be significant in the areas of fire management (the Centre is working on an ACIAR project in Eastern Indonesia and is collaborating with NASA in validating satellite remote-sensing techniques in fire management).

Collaboration between researchers and end users This allows relationships to develop and learning to occur that ultimately enables research to be used effectively. A scan of the Land Managers/Community column in Table 6 shows that most projects in Themes 2 and 3 have direct links with the community that will use their research or through links with a partner agency. This is mostly participative research that actively involves end-users in the project and is an important part of the Centre's technology transfer and utilisation strategy (see page 8).

An important partner in the Centre's collaboration is NAILSMA—the North Australian Land and Sea Managers Alliance—a partner in the Centre, and itself a collaborative group of Indigenous land and sea management groups across north Australia. NAILSMA and its networks play a major role in a number of Centre projects.

Management and Communication Strategies that Foster Collaboration

Collaboration between researchers

Developing collaboration works best when the people involved want to collaborate, and in the case of the tropical savannas, the opportunity the Centre provides for often isolated researchers from across the north to work together on problems of mutual interest is generally welcomed. As long as care is taken in projects to

provide enough funding and resources for travel and meetings, then much of this collaboration between researchers takes care of itself.

In 2004–05 the following major workshops and conferences were supported by the Centre

- *International Property Rights Workshop*, held at Undara, Queensland, 28 February – 4 March 2005. This expert workshop was jointly funded by the Tropical Savannas and Desert Knowledge Cooperative Research Centres and CSIRO SE, and explored the role of property rights in development of savanna regions. There was a specific focus on natural resources and nature-based industries. The workshop brought in international expertise in this field and made it relevant to the context of Australia's savanna and desert landscapes.
- *Multiple Use of Tropical Savannas Workshop*, Townsville, 10–11 October 2004. Convened by Romy Greiner, This expert workshop was jointly funded by the Tropical Savannas and Desert Knowledge Cooperative Research Centres and CSIRO SE. The workshop explored multiple use of savanna regions, bringing in researchers from across Australia in this field and made it relevant to the context of Australia's savanna and rangelands landscapes.
- *Weed Risk Management Workshop* The TS–CRC, in conjunction with the NT DNRETA and the Weeds CRC, hosted a workshop on WRM development for staff from a range of sections of the NT Government. Outcomes included an agreed process for further development and the formation of a Technical Committee and a Steering Committee which represent a range of stakeholder interests.
- *Regional planners workshop* held in Brisbane, 9 March, to share lessons and experiences between (16) regional NRM planners and consultants engaged in NRM plan development from Queensland, the Northern Territory and Western Australian regions. This was supported by the preparation and distribution of a 'Trigger paper' to workshop participants drawing on the findings of the 2005 review of accredited regional NRM plans.
- *TS–CRC Bi-Annual meeting, October 2004*. This bi-annual retreat involved everyone in the CRC from the Board down to students. It featured presentations on research and workshops on knowledge-building, adoption of research and the future direction of the CRC.

This list does not include numerous smaller workshops and meetings that developed collaborative links within individual CRC projects. See Table 8 Presentations—Staff Outreach Activities, which summarises these meetings (page 79).

Collaboration between researchers and research users

It can be more difficult to foster collaboration between researchers and research users because the cultural distance between these groups is often great. The key strategies here are participative research and capacity building. Participative research is encouraged in all CRC projects and allows collaboration to grow as local users and researchers work and learn together. Capacity building is a focus of a number of CRC projects that work with Indigenous communities and pastoral enterprises and allows researchers and research users to collaborate more effectively (see project report on *Indigenous Capacity Building*, page 45).

Various meetings are organized that assist collaboration between researchers and research users: the Savanna Advisory Committee, consisting of research users and stakeholders is an important way in which these groups can influence project selection and development; local research users are invited to each joint Board and Savanna Advisory Committee meeting to provide feedback on the Centre's activities. In addition various workshops and meetings bring together researchers and research users, usually associated with individual projects. In 2004–05 these included:

- *North Australian Fire Managers Forum*, Cairns, 27 August, 2004. This regular workshop chaired by the TS–CRC involved the major users of fire research in the savannas: the three rural fire agencies from Western Australia, the Northern Territory and Queensland as well as senior representatives of the major Queensland NRM agencies, together with fire researchers and CEOs of the Tropical Savannas and Bushfire CRCs. The workshop reviewed progress in adoption of fire research and the impact of Queensland's new vegetation management legislation on fire management.
- *North Australian Fire Managers Forum*, Darwin, 17 March 2005. This was another of the twice-yearly meetings chaired by the TS–CRC and involving the major fire management agencies, and fire researchers and CEOs of the Tropical Savannas and Bushfire CRCs.

- *NHT North Australian Fire Knowledge Project* workshop, Cairns, 18-19 November, 2004. This meeting drew together a range of NRM groups from across north Australia and fire researchers to help develop tools and information for the NHT-funded Fire Knowledge Project.
- *NAILSMA Workshop* In August 2004, 200 Traditional Owners attended the first forum for the North Australian Indigenous Land and Sea Management Alliance to discuss a way forward for the north's Indigenous people post Land Rights and Native Title. The meeting was held at Mennggen Aboriginal Land Trust west of Katherine, the forum was co-hosted by Traditional Owner Bill Harney, the Wardaman Association and NAILSMA.
- *Bankers Forum: Grazing Land Management*, Wambiana Station, west of Charters Towers, Queensland, 17–18 February, 2005. This forum, organised by the North Queensland Beef Research Council with support from the TS–CRC, aimed to educate rural bankers on the ecological principles of sustainable land management. It brought together bankers, grazing families and grazing scientists for significant discussion of landscape functionality and its impacts upon pasture and animal production. A one-day field trip was included to the grazing management trials held at Wambiana Station.
- *Indigenous Weeds Workshop*, Daly River, Northern Territory, November 2–4, 2004. This three-day weed workshop brought together Aboriginal rangers from various communities. Representatives from various NRM agencies and the NHT attended the workshop. Hosted by Albert Myoung and the Malak Malak people from Wooliana Community, the workshop's aim was to bring together Aboriginal Ranger groups in the Top End, particularly those working as part of the Top End Aboriginal Land Management and Employment Strategy, with other agencies working on Aboriginal weed management so that knowledge could be shared.

Information Resources that foster collaboration

Researchers and user groups are also provided with information that fosters collaboration. *Savanna Links* is a quarterly newsletter produced by the CRC that is distributed to over 3000 people across the savannas – users and researchers. It describes current NRM research in the savannas as well as having stories on savanna stakeholders and their research needs.

Nine issues of the Centre's email newsletter *Topical Savannas* were also sent out to more than 520 researchers and associates of the Centre across northern Australia. This newsletter describes the Centre's activities in more details as well as providing information on other savanna research, workshops, conferences, funding opportunities, savanna job vacancies. *Topical Savannas* continues to increase its readership in 2004-05; the distribution trebling over the last few years. Ninety three issues have now been sent out. This newsletter is archived on the Centre's internal website (accessible to CRC researchers and staff only) and is linked to web-based information resources.

Kantri Laif, a newsletter aimed at anyone interested in Indigenous natural and cultural resource management in north Australia, was launched in mid-2005. Produced by NAILSMA, it aims to tell the good news stories about what people are doing on-country in communities across the north as well as being a place where people can raise issues that are important to them. More than 2700 copies of the first issue were distributed to communities across the north and to NRM agencies. The newsletter can also be downloaded from the TS–CRC's website: http://savanna.cdu.edu.au/publications/kantri_laif.html

The Centre now provides further electronic options for linking staff. Videoconferencing is used frequently to link staff in meetings. Researchers and students can update their own web pages and a facility is available for development of further and a facility is available for development of separate websites for areas of particular interest.

Table 6 Collaborative links

Project (No. Name, Main location, Date Began)	Themes Cooperative Linkages							
	LEH	NRM	RPM	HCD	Overseas Contacts	Land Managers / Community	Other CRC Projects	Other Australian Agencies
1.1.3 Soil biota, nutrients and water in savannas, CSIRO SE & L&W, 2001	✓				Universities of Wurzburg and Ruhr, Germany University of Cape Town, South Africa Natural History Museum of London	Heytesbury Beef EWL Sciences	1.1.4 3.3.7	MLA QDPIF UQ
1.1.4 Savanna carbon dynamics, CSIRO SE, 2001	✓					QLD Nickel Geospatial Consultants Australia	1.1.3 3.3.7	NTU NTDBIRD QDPIF JCU CDU AGO MLA Bushfire CRC Greenhouse CRC
1.1.5 Impacts of exotic grasses, CDU, 2002	✓						3.3.7	Weeds CRC NT DNRETA CSIRO SE QPWS UQ NSW Agriculture APCC (SA) ADO Parks Australia (North)
1.2.1 Savanna Riparian Health, NTU, JCU, 2002	✓				University of California (Davis)	Burdekin Dry Tropics Board	2.1.2	QEPA QPWS QDNRME Parks Australia (North) UWA CSIRO SE CSIRO LW UQ NT DNRETA

Table 6 Collaborative Links cont.

<i>Project (No. Name, Main location, Date Began)</i>	<i>Themes Cooperative Linkages</i>							
	<i>LEH</i>	<i>NRM</i>	<i>RPM</i>	<i>HCD</i>	<i>Overseas Contacts</i>	<i>Land Managers / Community</i>	<i>Other CRC Projects</i>	<i>Other Australian Agencies</i>
2.1.1 Grazing Management Tools, NT DPIF, 2003		✓				VRDCA BRAC Sturt Plateau BPG KPIAC Roper Landcare Group CLMA DUBC NGNRG NAPCO AACo WADA Stanbroke Heyetesbury Beef	2.1.2 2.1.4 2.2.1	NT DNRETA QDPIF QDNRME WA Ag

Table 6 Collaborative Links cont.

Project (No. Name, Main location, Date Began)	Themes Cooperative Linkages							
	LEH	NRM	RPM	HCD	Overseas Contacts	Land Managers / Community	Other CRC Projects	Other Australian Agencies
2.1.4 FIREPLAN, BFCNT, 2002		✓			Indonesian Fire Managers (through ACIAR) University of Stockholm Japanese Space Development Agency (NASDA) University of California, Irvine NASA European Space Agency Texas A&M University Tropical Research Institute, Portugal	BFCNT VRD regional committee Sturt Plateau Best Practice Group Balkanu KAPA Jawoyn Assoc. Regional NHT groups in north Australia	2.1.1 4.4.2	CSIRO SE CDU JCU BFCNT Murdoch Uni EA ADF NLC PWCNT NTDBIRD EPA (Qld) QNRME QFRA QPWS AGWEST CALM WA WA FESA DOLA WA RIRDC ERIN Melbourne Uni. WWF NAFMF AGO
2.2.1 Beef industry best practice, TS-CRC Darwin, 2001		✓				NABRC VRDCA Sturt Plateau Group NGRMG Cape River Management Group NTCA CLMA	2.1.1 2.1.2 2.2.3 4.3.2	QDPI QNRME NTDBIRD CSIRO SE MLA AGWEST

Table 6 Collaborative Links cont.

<i>Project (No. Name, Location, Date Began)</i>	<i>Themes Cooperative Linkages</i>							
	LEH	NRM	RPM	HCD	<i>Overseas Contacts</i>	<i>Land Managers / Community</i>	<i>Other CRC Projects</i>	<i>Other Australian Agencies</i>
2.3.3 Indigenous ecological knowledge for land management, KLC, NLC, BCYDC 2002		✓			University of London Royal Botanic Gardens, Kew	Various Aboriginal Communities across north Australia KALACC Balkanu NHT CYP Fire project NHT Ang Gnarra Ethnobotany project	1.2.2 4.4.2	NHT NAILSMA Kimberley Land Council University of South Australia University of the Sunshine Coast State Herbarium of South Australia
2.4.2 Savanna Biodiversity Shopfront DNRETA, 2001	✓				Conservation International, USA	Heytesbury Beef Roper River Landcare Group Regional NHT groups in north Australia	4.3.1 2.1.4 4.3.2	CSIRO SE QPWS QEPA QDPIF QDNRME NLWRA LWA DEH
3.1.3 Participatory knowledge building, UQ, 2002			✓			NGRMG Carpentaria Shire	Various CRC Projects	QPWS BFCNT QDPIF CSIRO SE CDU JCU QDNRME
3.3.4 Outback Livelihoods			✓				3.3.5 3.3.6	

Table 6 Collaborative Links cont.

<i>Project (No. Name, Main location, Date Began)</i>	<i>Themes Cooperative Linkages</i>							
	LEH	NRM	RPM	HCD	Overseas Contacts	Land Managers / Community	Other CRC Projects	Other Australian Agencies
3.3.5 Healthy Savanna Planning Systems CSIRO SE, 2001			✓			NGRMG Various other regional bodies	3.1.6	UQ QNRME NT DNRETA DEH Coastal CRC
3.3.6 Multiple use in Savanna Regions, CSIRO SE, 2003			✓		University of Indiana (USA)	Carpentaria & Burke Shire Councils Gulf Savannah Development Tourism Queensland Karumba progress association Savannah Guides	3.3.7	UQ Tourism CRC QDPI JCU CDU Desert Knowledge CRC

Table 6 Collaborative Links cont.

Project (No. Name, Location, Date Began)	Themes Cooperative Linkages							
	LEH	NRM	RPM	HCD	Overseas Contacts	Land Managers / Community	Other CRC Projects	Other Australian Agencies
4.1.1 Provision of Higher Education, TS-CRC Darwin, 2001				✓	Satya Wacana Christian University (Indonesia) through ACIAR project	VRDCA	Various Projects	JCU UQ Batchelor Institute CSIRO SE NT DNRETA CRC for Aboriginal Health Tropical Plant Protection CRC Bushfire CRC
4.3.1 Communication Resources, TS- CRC Darwin & Townsville, 2001				✓		Various Research users and Communiti es across north Australia (see other groups in this column)	All projects	All Partner Agencies
4.3.2 Tropical Savannas Knowledge for Schools, TS- CRC/NT DEET 2003				✓		Nine schools in the NT AAEE	4.4.2 2.2.1	CDU NT DNRETA CSIRO SE Greening Australia AQIS
4.4.1 Capacity Building in Agencies, CDU				✓				
4.4.2 Integrating Research and Indigenous Management, TS- CRC, NAILSMA Darwin, 2002				✓	Christensen Fund (USA)	Various Aboriginal Communiti es across north Australia	2.1.4 2.3.3 4.3.2	Balkanu, NLC CFCU KLC ANU CAEPR NTU KCTWM BFCNT NT DNRETA ILC

Specified Personnel

The head office of the TS–CRC is at the Charles Darwin University, Darwin, with a second office at James Cook University, Townsville and support from the Department of Agriculture in Western Australia at Kununurra.

The Darwin office has six staff: the Chief Executive Officer; Communication Coordinator; Business Manager; Assistant to the CEO; Tropical Savannas Knowledge in Schools Project Leader; and Assistant to the Business Manager. The Townsville office has one full-time staff member: the Publications and Web Manager and one part-time assistant for this role.

Table 7 Specified Personnel

Title and Name	Contributing Organisation	% of total working time in CRC	Role in Centre
Prof G Duff	CRC	100	CEO
P Jacklyn	CRC	100	Communication Coordinator and Theme Leader 4
B Slatter	CRC	100	Business Manager
D Garnett	CRC	100	Contracts Manager
J Ludwig	CRC/CSIRO	100	Theme Leader 1
J Landsberg	CRC/QLD	95	Theme Leader 2
P Novelly	CRC/WA	5	Theme Leader 2
P Whitehead	CRC/Northern Territory/CDU	40	Theme Leader 3
J Morrison	CRC/Northern Territory	50	Theme Leader 4

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Dawson, S.J., McDonald, G.T., et al, 2004, *Northern Gulf Region Natural Resource Management Plan*. Georgetown, Northern Gulf Resource Management Group and Tropical Savannas CRC.

Fensham R.J. & Fairfax, R.J. 2004, *Structural change in gidgee woodlands*, preliminary report to Queensland Herbarium Environmental Protection Agency, Brisbane and Tropical Savannas Management CRC, Darwin.

Fisher, A. & Milne D. 2005, *Preliminary Conservation Assessment of Broadmere Station, Northern Territory*. Tropical Savannas CRC and NT DIPE, Darwin.

Fisher, A., Hunt, L., James, C., Landsberg, J., Phelps, D., Smyth, A. & Watson, I. 2004, *Total Grazing Pressure and Biodiversity in the Rangelands*, Report to the Dept of Environment, Desert Knowledge and Tropical Savannas Cooperative Research Centres, Alice Springs & Darwin.

Greiner, R., Mayocchi, C., Larson, S., Stoeckl, N. & Schweigert, R. 2004, *Benefits and costs of tourism for remote communities: Case study for the Carpentaria Shire in north-west Queensland*, Tropical Savannas CRC, James Cook University & CSIRO Sustainable Ecosystems, Townsville.

Greiner, R. & Larson, S. 2004, *The relationship between landholders and tour operators: An investigation of the areas adjoining the Gibb River Road in the North Kimberley*, Tropical Savannas CRC, James Cook University & CSIRO Sustainable Ecosystems, Townsville.

Greiner, R., Larson, S., Herr, A. & Pinger, P. 2005, *Independent travellers in the North Kimberley: Benefits, impacts and management challenges*, Tropical Savannas CRC, James Cook University & CSIRO Sustainable Ecosystems, Townsville.

Guenther, J. Young, M. Boyle, A. Schaber, E. & Richardson, J. 2005, *Regional and educational profiles of the Australian desert and its Indigenous peoples, Stage 1 Report*, Desert Knowledge CRC and National Centre for Vocational Education Research, Adelaide.

Milne, D., Risler, J., Fisher, A., Legge, S. & Murphy, S. 2005, *Preliminary fauna survey and monitoring the effects of destocking, Mornington Wildlife Sanctuary (Central Kimberley), Nov. 2004*. Tropical Savannas CRC and Australian Wildlife Conservancy, Darwin and Perth.

Morrison, J. 2004, *North Australian Indigenous Land and Sea Management Alliance Forum Report 1–2 September*, NAILSMA, Tropical Savannas CRC, Darwin, Northern Territory.

Petty, A., Lindner, D., Freeman, J. & Bowman, D. 2005, *Final Report of the Kakadu National Park Channel Change Project*, Charles Darwin University, Darwin, Australia

Russell-Smith, J.A., Edwards, C., Cook, G.D., Brocklehurst, P. & Schatz, J. 2004, *Improving greenhouse emissions estimates associated with savanna burning in northern Australia: Phase 1*, Final Report to the Australian Greenhouse Office. Tropical Savannas CRC, Darwin. 27 pp, plus databases.

Stoeckl, N. & Stanley, O. 2004, *Predicting regional and landscape dynamics in Australian Savannas — Economic Dimensions*, Final report to Tropical Savannas CRC, James Cook University, Townsville.

Taylor, R., Woinarski, J., Charlie, A., Dixon, R., Pracy, D. & Rhind, S. 2004, *Report on mammal survey of the Pellew Islands, October 2003*, Northern Territory Department of Infrastructure Planning and Environment, Darwin.

Vella, K. & Nursey-Bray, M. 2005, *Frameworks and analysis of institutional arrangements for multiple use: reflections—Etheridge Shire*, CSIRO Sustainable Ecosystems, Townsville.

Watson, M. & Woinarski, J. 2004, *Vertebrate monitoring and resampling in Kakadu National Park, 2003*, Report to Parks Australia North, Parks and Wildlife Commission of the Northern Territory, Darwin.

Woinarski, J. 2004, *Threatened plants and animals in Kakadu National Park: a review and recommendations for management*, Report to Parks Australia North. Parks and Wildlife Commission of the Northern Territory, Darwin.

Woinarski, J.C.Z. (2004). *National multi-species Recovery Plan for the Partridge Pigeon [eastern subspecies] Geophaps smithii smithii; crested shrike-tit [northern (sub)-species] Falcunculus (frontatus) whitei; masked owl [north Australian mainland subspecies] Tyto novaehollandiae kimberli; and masked owl [Tiwi Islands subspecies] Tyto novaehollandiae melvillensis, 2004–2008*. NT Department of Infrastructure Planning and Environment, Darwin.

Woinarski, J.C.Z. (2004). *National multi-species Recovery Plan for the Carpentarian Antechinus Pseudantechinus mimulus, Butler's Dunnart Sminthopsis butleri and Northern Hopping-mouse Notomys aquilo, 2004-2008*. NT Department of Infrastructure Planning and Environment, Darwin.

Discussion paper

Armstrong, R. Morrison, J. & Yu, P. 2004, *A structure for the Strategic Development of the North Australian Indigenous Land & Sea Management Alliance*, NAILSMA, Tropical Savannas CRC, Darwin, Northern Territory.

Newsletters

Dixon, I., Dowe, J., & Douglas, M. 2005, 'Assessing riparian health in tropical savannas', in *Australian Landcare*, March 2005, Agricultural Publishers.

Dixon, I. & Douglas, M. 2004, 'Expedition checks out river health', in *Savanna Links*, Issue 30, Oct.–Dec. 2004, Tropical Savannas CRC, James Cook University, Townsville.

Morrison, J. 2004,

'Introducing NAILSMA', in *Kantri Laif*, Issue 1, Wet/Dry, 2004, North Australian Indigenous Sea and Land Management Alliance, Tropical Savannas CRC, Darwin.

Kantri Laif, Issue 1, Dry/Wet, 2004. L. Binge, (ed), North Australian Indigenous Sea and Land Managers Alliance, Tropical Savannas CRC, Darwin.

Savanna Links, Issue 29, July–September, 2004, K. O'Donnell, P. Jacklyn, (eds), Tropical Savannas Management CRC, James Cook University, Townsville.

Savanna Links, Issue 30, October–December, 2004, K. O'Donnell, P. Jacklyn, (eds), Tropical Savannas Management CRC, James Cook University, Townsville.

Savanna Links, Issue 31, January–June, 2004, K. O'Donnell, P. Jacklyn, (eds), Tropical Savannas Management CRC, James Cook University, Townsville.

Kernot, J. 2005, 'Fire relief for shrub relief' in *Savanna Links*, Issue 31, January–June, 2005, Tropical Savannas CRC, James Cook University, Townsville.

Ritchie, E. 2004, 'Unique kangaroo a tropical treasure', in *Savanna Links*, Issue 29, January–June, 2005, Tropical Savannas CRC, James Cook University, Townsville.

Fisher, R. 2004, 'Northern fire research links to Indonesia' in *Savanna Links*, Issue 29, January–June, 2005, Tropical Savannas CRC, James Cook University, Townsville.

Morrison, J. 2004, 'Alliance hope for Aboriginal voice on land issue', in *Savanna Links*, Issue 29, January–June, 2005, Tropical Savannas CRC, James Cook University, Townsville.

Communication Strategy

In 2004–05 the Tropical Savanna CRC’s Communication Strategy assisted with the take-up of research by users, helped raise the awareness of the Centre’s activities and saw a significant increase in media coverage.

Communication and the pathway to adoption

The Centre’s communication strategy is focused on ensuring our research gets used and makes a difference. The communication used here is not “tacked on” to the end of the research process but is integrated into the management and conduct of the research as described in the section on technology transfer and use and in the section on collaboration:

- End users are asked about what research projects they need through the extensive networks built up by the Centre over the last few years so that research is initiated by user demand where possible.
- End users are actively involved in participative research
- Communication resources are provided to assist capacity building in both researcher and research user groups.
- Communication resources are provided so that project participants keep in touch and work collaboratively
- Theme leaders are given communication roles to ensure collaboration
- Once an area of research emerges as being ready for successful adoption, considerable communication resources are then provided to produce practical tools. A range of media are used to suit different users and applications.

The isolation, cultural diversity and low capacity of many savanna user groups and even many research groups means that the TS–CRC does focus on research-based Knowledge Brokers like some other CRCs. Instead the CRC uses a mix of people, some of whom broker knowledge, others of whom may broker resources and funds to implement the broad adoption strategy above.

Communication and raising awareness

In the longer term it may be difficult to sustain well-informed land management policies and practices in the tropical savannas without having a well-informed broader, mostly urban community. To raise awareness of the tropical savannas in this broader community requires considerable resources, and the TS–CRC’s strategy here is to use the education system to raise awareness rather than focusing on the mass media or public presentations. The recently established project *Tropical savannas knowledge for schools* aims to provide information on the tropical savannas tailored to the primary and secondary school curricula in northern Australia.

In the short term, however, some sections of the broader community can be targeted effectively. TS–CRC researchers continue to attract widespread media interest through our partner agencies, with appearances on national shows such as *Bush Telegraph*, as well as local print media and radio. The CRC continues to contribute to the Science in Radio series on local ABC radio in Townsville, where CRC researchers regularly discuss their area of research interest. Care is taken not to jeopardise the pathway to adoption strategy above with these awareness raising activities—collaborative links will not be risked for the sake of a high-profile media coverage.

Public presentations

As the TS–CRC sees the education system as being the main vehicle for raising public awareness, rather than public presentations, our public presentations are largely aimed at savanna stakeholders who have an interest in aspects of our work. See the list of presentations on page 74.

Various displays of the Centre’s activities were shown at local events that attracted audiences interested in sustainable land use and conservation.

- A display on the Centre’s NAFI website is on loan to the Queensland Rural Fire Service and was shown at various locations in outback Queensland
- Display at CRCA association conference, 18–20 May, 2005.

- Weeds Conference Display
- Display at NT Innovation Awards

Public relations and communication

- In 2004–05 the TS–CRC’s media coverage increased significantly over our 2003–04 media coverage. Numerous articles and stories about the Centre’s activities and outputs appeared in a variety of media, many in smaller newsletters that reach communities of research users (see page 79).
- The quarterly newsletter *Savanna Links* reaches around 3000 people across northern Australia interested in the tropical savannas. The newsletter helps raise awareness of the tropical savannas and land management issues in the broader community.
- *Kantri Laif* a newsletter on Indigenous natural and cultural resource management, produced by NAILSMA, was launched in 2005. More than 2700 copies were distributed to Indigenous organizations and communities across north Australia as well as to NRM agencies and groups involved in Indigenous land management.
- The Centre’s website continues to be a major path to raising awareness about the tropical savannas. The site has more than 25,000 page downloads a week.
- The Centre’s *North Australian Fire Information* website, although aimed at fire managers, continues to received considerable publicity in the broader NRM community and raised awareness of fire management in the north.
- The Centre’s had over 2700 of its publications, plus thousands of newsletters, sold or distributed in 2004-05 and while these publications are largely aimed at land managers and planners many of them are stocked in public libraries across the savannas and publications such as the natural history publication *Termites of Northern Australia* are greatly appreciated by the general public.

Presentations

National

Bellamy, J. & McDonald, G. 2004, ‘Sustainable regional development: “Walking the talk” through enhancing regional governance capacity’, paper presented to the Australia New Zealand Regional Science Association International, Conference, Wollongong, 28 September–1 October.

Brazier, J. 2004, ‘Tracking sources and pathways of Rum Jungle metals through the Finnis River, Northern Territory, Australia’, paper presented to Interact 2004, July 5–8, Gold Coast.

Brazier, J. 2004, ‘Impacts of Acid Rock Drainage: Local or Landscape scale? A case study at Rum Jungle, paper presented to the 2004 Tropical Savannas CRC and Minerals Council, Environmental Workshop, 14–15 October.

* Cook, G.D., Dawes-Gromadzki, T.Z. & Liedloff, A.C. 2004, Management challenges and approaches in semi arid and arid lands’, paper presented to the International Soil Conservation Conference, Brisbane, 4–8 July.

Dawes-Gromadzki, T. Z. 2004, ‘Bugs beneath the surface: biodiversity, degradation and the functional roles of soil macroinvertebrates in maintaining ecosystem health in Australia’s tropical savannas’, paper presented to the International Congress of Entomology, Brisbane, 15–21 August.

Dixon, I.H., Douglas, M.D., Dowe, J.L., Burrows, D.W. and Townsend, S.A. 2005, A Rapid Method for Assessing the Condition of Riparian Zones in the Wet/Dry Tropics of Northern Australia, paper presented to the 4th Australian Stream Management Conference; linking rivers to landscapes, Launceston, Tasmania, 19–22 October.

Dawes-Gromadzki, T. Z. 2004, ‘Soil health, macrofauna and rehabilitation in tropical Australia’, paper presented to the Ecological Society of Australia conference, Adelaide, 7–10 December, 2004.

- Douglas, M. 2004, 'A rapid method for assessing the condition of riparian zones in the wet/dry tropics of northern Australia', presented to the 4th Australian Stream Management Conference; linking rivers to landscapes, Launceston, Tasmania, 19–22 October.
- Douglas, M. 2004, 'Food webs in Australia's wet–dry tropical rivers', presented to the Annual Conference of the Ecological Society of Australia, Adelaide, 7–10 December.
- * Douglas, M.M. & Setterfield, S.A. 2005, 'Impacts of exotic tropical grasses: Lessons from gamba grass in the Northern Territory', invited paper presented to the 8th Queensland Weed Symposium, Townsville, Queensland, June 20–23.
- Douglas, M.M. & O'Connor, R.A. 2004, 'Effects of para grass (*Urochloa mutica* (Forssk.) .Q.Nguyen) invasion on terrestrial invertebrates of a tropical floodplain', paper presented to the 14th Australian Weeds Conference, Wagga Wagga, September 6–8.
- Douglas, M.M., Setterfield, S.A., Rossiter, N.A., Barratt, J.L. & Hutley, L.B. 2004, 'Effects of mission grass (*Pennisetum polystachion* L.Schult.) invasion on fuel loads and nitrogen availability in a northern Australia tropical savanna', paper presented to the 14th Australian Weeds Conference, Wagga Wagga, September 6–8.
- Felderhof, L. 2004, 'Fire patterns in northern Australia: variation at the regional scale', presented to the Annual Conference of the Ecological Society of Australia, Adelaide, 7–10 December.
- *Fisher, A. 2004, 'Land condition as a surrogate for biodiversity health in tropical savanna rangelands', invited paper presented to the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.
- Gerritsen, R. & Straton, A. 2005, 'Coping with a tragedy of the Australian Aboriginal common', presented to the International Property Rights Workshop, Undara, Queensland, 28 February – 4 March.
- Greiner, R. 2005, 'Property rights: Key to achieving ecologically sustainable development in outback regions?' presented to the International Property Rights Workshop, Undara, Queensland, 28 February – 4 March.
- Greiner, R. & Friedel, M. 2004, 'Tourism as driver for regional growth and diversification', paper presented to the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.
- Greiner, R., Sutcliffe, K., Gunn, R., & Unsworth, S. 2004, 'Challenges for realizing improved tourism benefits for remote host communities: the case of Carpentaria Shire', presented to the 3rd National Conference on Tourism Futures, Townsville, 4–6 August.
- Greiner, R. 2004, 'From multiple use to multifunctionality of landscapes', presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Guenther, J. 2005, 'Effective outcomes of VET in savanna communities', paper presented to the Council for Australian University Tourism and Hospitality Education National Research Conference, Alice Springs Convention Centre, Alice Springs, 1–5 February.
- Guenther, J. 2005, 'What makes vocational education and training outcomes effective in tropical savanna communities? With special reference to tourism and hospitality', paper presented to the Council for Australian University Tourism and Hospitality Education National Research Conference, Alice Springs Convention Centre, Alice Springs, 1–5 February.
- Guenther, J. 2005, 'Pathways to effective training outcomes: lessons from northern Australia', paper presented to the Australian Vocational Education and Training Research Association Annual Conference, Brisbane, 13–15 April.
- Guenther, J Young, M Boyle, A Schaber, E & Richardson, J 2005, *Growing the desert: Effective educational pathways for remote Indigenous peoples*, Desert Knowledge CRC, National Centre for Vocational Education Research, Adelaide.
- Herr, A. 2004, 'Integrating multiple perspectives and disciplines in the natural resource management context', presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Johansen, K. 2004, 'Mapping Indicators of riparian vegetation health using IKONOS and Landsat ETM+ data in Australian tropical savannas', paper presented to the Inaugural Queensland Spatial Industry Conference, Brisbane, Australia, 22–23 April.

- Larson, S., Herr, A. & Greiner, R. 2004, 'What are the ecological impacts of tourism on Kimberley region of Western Australia?', paper presented to the Annual Conference of the Ecological Society of Australia, Adelaide, 7–10 December.
- Larson, S. 2004, 'Human and social capital and capacity to diversify in outback Australia', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Lankester, A. 2005, 'An investigation of the social issues underpinning riparian management in the upper Burdekin River catchment', paper presented to the Ozwater Watershed Specialist Conference, Townsville, 5–7 May.
- Liedloff, A. C. & Ludwig, J. 2004, 'Using the Savanna.au model to understand the functioning of Australia's northern rangelands', paper presented to the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.
- Ludwig, J. 2004, 'Landscape health: Broadening the concept to assess multiple land use', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Moffatt, J. 2004, 'Inclusive Rural Governance' paper presented to the Sustainable Economic Growth for Regional Australia conference, 'Big Ideas for Regional Australia', Alice Springs, Northern Territory, 6–8 September.
- Nursey-Bray, M. 2004, 'In whose interest? Multiple use and third party/national interest', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- O'Reagan P.J. & Bushell J.J & Holloway C.H. 2004, 'Litter fall and nutrient input by three tree species in a semi-arid tropical savanna', paper presented to the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.
- Pero, L. 2004, 'Regional natural resource management planning: the challenges of evaluation as seen through different lenses', CSIRO/CIRM Occasional Symposium, Brisbane, 15 October.
- * Richardson, K.M. 2004, 'Rangeland Monitoring with MODIS 250M Data' paper presented to the Australian Rangeland Society 13th Biennial Conference—Living in the Outback, Alice Springs, NT, July 5–8.
- Ritchie, E.G. 2004, 'Sexual segregation in a tropical macropod (*Macropus antilopinus*)', paper presented to the 50th Australian Mammal Society Meeting, Tanunda, South Australia 5–8 July.
- Rolfe, J. 2005, 'The potential for market mechanisms to achieve vegetation protection in the Desert Uplands', paper presented to the International Property Rights Workshop, Undara, Queensland, 28 February – 4 March.
- Rossiter, N., Setterfield, S.A., Douglas, M.M., Hutley, L.B. & Cook, G. 2004, 'Exotic grass invasion in the tropical savanna of northern Australia: ecosystem consequences', paper presented to the 14th Australian Weeds Conference, Wagga Wagga, September 6–8.
- Sangha, K., & Greiner, R. 2004, 'Multiple land use: Economic concepts and international examples', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Smajgl, A. 2004, 'Users as agents: to what degree can we stylise people?', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Smith, C. 2004, 'Integrating disparate knowledge to improve Natirra Resource Management', paper presented to ISCO 2004—the 13th International Soil Conservation Organisation Conference, Brisbane, 4–9 July.
- Stoeckl, N. & Stanley, O. 2004, 'Modelling the Australian Savannas', paper presented to the 7th Annual International Conference of the American Society of Business and Behavioural Sciences, Cairns Convention Centre, Cairns, Queensland, August 6–8.
- Smajgl, A., Nursey-Bray, M., Vella, K. & Herr, A., 2005, 'Building institutional incentives in dying communities—Sexing up the outback', paper presented to the International Workshop on Property Rights, Undara, Queensland, 28 February – 4 March.
- Smajgl, A. 2005, 'Building institutional incentives in dying communities', paper presented to the International Property Rights Workshop, Undara, Queensland, 28 February – 4 March.

- Setterfield, S. 2004, 'Understanding changing fire processes in Australia's tropical savannas', paper presented to the Annual Conference of the Ecological Society of Australia, Adelaide, 7–10 December.
- Straton, A. 2004, 'Network theoretic principles of sustainable resource allocation', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Taylor, B. 2005, 'Regional natural resource planning in Northern Australia: Progress, challenges & prospects', paper presented to the Planning Institute of Australia's National Congress, Melbourne, 18 April.
- Valentine, L. 2004, 'Responses of bird assemblages to repetitive management burning in grazed tropical savannas', paper presented to the Botany/Zoology of North Queensland (BZoNQ) conference, Cairns, Queensland, 6–7 November.
- Valentine, L. 2004, 'Burning the bush—do reptiles really care?', paper presented to the Australian Society for Herpetologist (ASH) conference, Springbrook, Queensland, 7–11 February.
- Vella, K. 2004, 'Multiple use—What does it mean in savannas?' paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Walker, M. & Hoverman, S. 2004, 'Healthy Savannas Planning project: Supporting better regional NRM through evaluation', paper presented to the *Regional NRM Planning Conference—Sharing lessons from NSW, Victoria and Queensland*, University of New England, Armidale, NSW, 23–24 November.
- Walker, M. et al, 2004 'Community engagement in natural resource management planning in Northern Australia', paper presented to the Participate 2004—International Association for Public Participation, Queensland State Conference, Brisbane, September.
- Whitehead, P. 2004, 'Multiple use: Indigenous values and interests', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- Witt, K. 2004, 'Land "ownership" and multiple use opportunities for Queensland's rangelands', paper presented to the Multiple Use of Tropical Savannas Workshop, Townsville, 10–11 October.
- * Wurm, P. 2005, 'Online resource management' Invited paper presented to the Academic Induction Workshop, Faculty of Education, Health & Science, Charles Darwin University, April.
- Ziembicki, M. 2004, 'Towards prediction and monitoring of nomadic bird distributions: a case study using the Australian Bustard', paper presented to the Annual Conference of the Ecological Society of Australia, Adelaide, 7–10 December.

International

- Bellamy, J. 2005, 'Regional NRM planning: learning from the Australian experience', paper presented to the Macaulay Land use Research Institute, Aberdeen, Scotland, 13 June.
- Bellamy, J. 2005, 'Linking science, policy and local governance for sustainable regional resource use planning', paper presented to the 2005 International Symposium on Society and Resource Management, Ostersund, Sweden, 16–19 June.
- Greiner, R., Larson, S. & Pinger, P. 2005, 'Impacts of tourism on peripheral regions in Australia', paper presented to the 11th International Symposium on Society and Resource Management, Ostersund, Sweden, 16–19 June.
- Johansen, K. & Phinn, S. 2004, 'Mapping indicators of riparian vegetation health using IKONOS and Landsat-7 ETM+ image data in Australian tropical savannas', paper presented to the IEEE International Geoscience and Remote Sensing Symposium, Anchorage, Alaska, USA, 20–24 September.
- Larson, S. & Greiner, R. 2005, 'Strategic Environmental Assessment (SEA) and Multiple Land Use in Outback Australia', paper presented to the 14th Annual Conference of the New Zealand Association for the Impact Assessment, Wellington, New Zealand 28–29 April.
- Valentine, L. 2004, 'Responses of bird assemblages to seasonal burning in grazed tropical savannas of northern Australia', paper presented to the Society for Conservation Biology (SCB) conference, Columbia University, New York, 29 July – 2 August 2004.
- Valentine, L. 2005, 'Impacts of management burning on reptile assemblages in grazed tropical savannas', paper presented to the 5th World Congress for Herpetology (WCH), Stellenbosch, South Africa, 19–24 June.

Witt, K. 2004, ‘‘Responsibility’ as an imperative for addressing property rights conflict’, paper presented to the 10th Biennial Conference of the International Association for the Study of Common Property, Oaxaca, Mexico, August 9–13.

Poster presentations

Fisher, A. 2004, ‘Biodiversity at the ‘‘Toorak’’ grazing trial, northwestern Queensland’, presented at the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.

Kutt, A. 2004, ‘Effects of an introduced pasture species on biodiversity in a tropical savanna woodland’, presented at the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.

Kutt, A. 2004, ‘The influence of different grazing strategies on the patterns of vertebrate fauna in a tropical savanna woodland’, presented at the Australian Rangelands Society 13th Biennial Conference—Living in the Outback, Alice Springs, 5–8 July.

Rolfe, J. & Shaw, K. 2005, ‘Improving land condition in semi-arid Tropical Australia’, presented at the International Grassland Congress in Ireland, 26 June – 1 July.

Workshops organised by Tropical Savannas CRC.

Workshop with graziers: Developing principles and guidelines for sustainable land management, Charters Towers DPI&F, 24 November 2004

Rural Bankers Forum, 2005, Ecological principles of sustainable land management, Charters Towers DPI&F, 17–18 February.

‘Risky business: Managing for climate variability’ Presentation to the Prairie Landcare group, Prairie, 5 November 2004.

Greiner, R. & Larson, S. 2004, ‘Community benefits from tourism: landholders and tourism’, presented to the Savannah Guides School, Kununurra 27–29 November.

Greiner, R., Larson, S. & Pinger, P. 2005, ‘Understanding the self-drive market in the North Kimberley’, presented to the Savannah Guides School, Lake Bennett 7–9 April 2005.

* Invited paper

TS–CRC researchers underlined.

Table 8 Presentations—Staff Outreach Activities

<i>Outreach Type</i>	<i>Pastoral Industry Sector/ Resource management</i>	<i>Conservation Interest Groups</i>	<i>Mining Industry Sector</i>	<i>Aboriginal Community Groups</i>	<i>Tourism Industry Sector</i>	<i>Researchers</i>	<i>Education; schools & tertiary</i>	<i>General Public/Politicians</i>
Workshop	6	2		1			1	
Seminar	1							
Fieldtrip	3							
Open Day						1		1
Presentations at Meetings	2	5		3		1	2	2

Table 9 Public relations and communication: Media coverage

Topic/subject	TV	Radio	Print	Online	Stakeholder newsletter
NAISMA, Indigenous research, Turtle and Dugong research; Weeds on Aboriginal lands		11	1	25	13
Fire knowledge project; North Australian Fire Information website; Fire research, national and international	2	16	11	35	9
Savanna riparian research				2	2
Biodiversity in northern Australia: Research, impacts and management (wallaroos, birds)		5	6	11	1
Threatening processes; impacts of weeds	1	6	2	9	1
Vegetation change; research and impacts of land management		2		5	3
Soil biota, nutrients and landscape health	6	5	2	7	
Carbon trading/ greenhouse accounting/ climate change		7		8	1
Beef Best Practice CRC project		2		2	
Tourism in the savannas		1		3	3
Tropical savanna knowledge for schools				1	1
CRC Land Manager website		1		2	1
New CRC/QDPIF publication: <i>Focus on Burdekin Rangelands</i>		1		3	2
New CRC reports on NRM				1	1
New book, Termites of northern Australia		8	1	10	2
Total	9	64	23	123	40

Grants and awards

Table 10 Grants

Researcher	Title of Grant	Funding Source	Amount	Period of Award
S. Setterfield, L. Hutley, CDU R. Williams, CSIRO SE	Fire behaviour and plant responses to fire in savannas following exotic grass invasion	CDU Project Grant	\$7800	2004–05
M. Douglas, B. Grace K. Ferdinands, CDU	Modeling landscape-scale impacts and invasion patterns of an exotic savannas grass	CDU Project Grant	\$7900	2004–05
N. Cranston, TS–CRC / CDU	Effectiveness of riparian fencing in the VRD	Victoria River District Conservation Association	\$9000	2003–05

Ms Natalie Rossiter, CDU, received the Eric Cuthbertson Award for best student presentation at the 2004 14th Australian Weeds Conference in Wagga Wagga.

Mr Euan Ritchie, JCU, was awarded the Joyce Vickery Research Award, Linnean Society of NSW, 2005, for his studies on The macroecology and conservation of the antilopine wallaroo.

Mr Euan Ritchie, JCU, also received two internal Research Awards, School of Tropical Biology, James Cook University, 2005, for his PhD on the macroecology and conservation of the antilopine wallaroo.

Ms Kate Richardson, NT DNRETA, won the Young Researcher Prize—Rangeland Biological Sciences, for her paper Rangeland Monitoring with MODIS 250 M Data at the Rangeland Society 13th Biennial Conference, Alice Springs.

Ms Leonie Valentine, JCU, was a Society for Conservation Biology conference student award finalist; she also received a JCU Graduate Research International Travel Award (\$843); and School of Tropical Biology, Internal Supplementary Funding – Conference Travel (\$1200).

Mr Kasper Johansen, UQ, received a Graduate School Research Travel Award

Dr Penny Wurm received a Training Fund Award from the SATSE Crawford Fund 2005 for Mr Dharma Palekahelu, visiting scholar, Satya Wacana Christian University, Indonesia.

Performance measures

Quality and Relevance of the Research Program

- Table 1: Consultancies and contracts secured by the Centre
- Figure 2: Number of publications that acknowledge the CRC
- Figure 3: Extent to which researchers are attracted to the Centre
- Figure 4: Awards and invited papers

Strategy for Utilisation and Commercialisation of Research Outputs

- Researchers participating in education and extension project activities. See Figure 5, Number of non-university or collaborative staff involved as supervisors.
- Figure 6, Media recognition focused on outlets for stakeholders (i.e. newsletters, etc. used by land managers, conservation managers and other research user groups)
- The NAFI website <www.firenorth.org.au> maps active fires and previously burned areas was well used by a range of fire managers in the 2003 fire season (several hundred to a thousand intensive visits to the site each week) and is now starting to transform fire management in the north.
- Outputs from the Mammal Status project have been adopted by the NT Parks and Wildlife master plan and have contributed to an increasing attention to northern Australia by a range of national conservation non-government organisations.
- Outputs from Project 2.1.2 *Biodiversity on grazing lands* are being adopted by major pastoral enterprises, rangelands training courses and regional management plans.
- Outputs from the Regional Planning project have been used by regional NRM planners to guide and inform development of the current round of plans.
- QPWS staff in north Queensland have been working with the Knowledge-building project to identify critical success factors and impediments to establishing an adaptive fire management system that works well. They are now starting to adopt and implement the findings of this project.
- More than 1850 publications on sustainable land management were sold in 2004–05 including over 200 copies of *Savanna Burning* on practical fire management. A further 923 publications were distributed free of charge.

Education and Training

- The equivalent of 17 full-time students enrolled in the Graduate Diploma and Master of Tropical Environmental Management (MTEM) courses in 2003–04. This compares with an equivalent of 15 full-time students for 2003. This compares favourably with the projected target of 100 MTEM students for this term of the TS–CRC.
- A total of 31 research students receive support from the TS–CRC, as either full scholarships, top-up scholarships or operational support. See Figure 7, Number of postgraduate students.
- TS–CRC is collaborating with the Indonesian university Satya Wacana Christian University (UKSW) to build capacity for postgraduate education in savanna management in eastern Indonesia.

Collaborative Arrangements

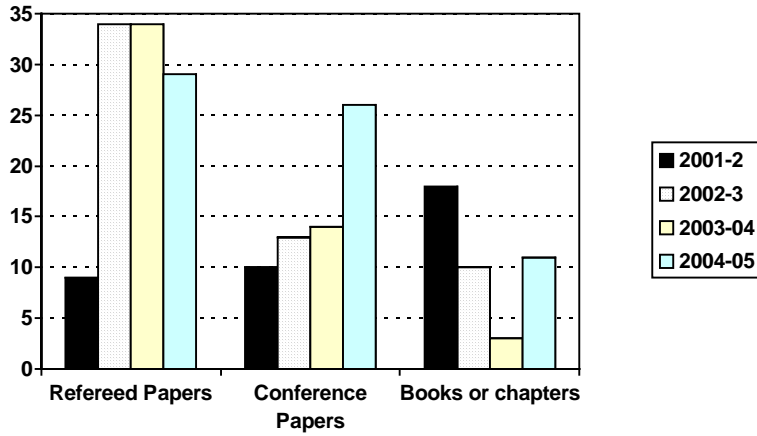
- 100 per cent of research projects are multi-agency.

Resources, Management Structure and Performance Evaluation

- Effective and efficient project management system.

- Resources committed in accordance with the Commonwealth's agreement under direction of the Board of Management, taking into account input from the Savanna Advisory Committee and the Management Group.

Figure 2 Number of Publications that acknowledge the CRC *



*(In press publications from previous year included)

Figure 3 Extent to which researchers are attracted to visit the Centre

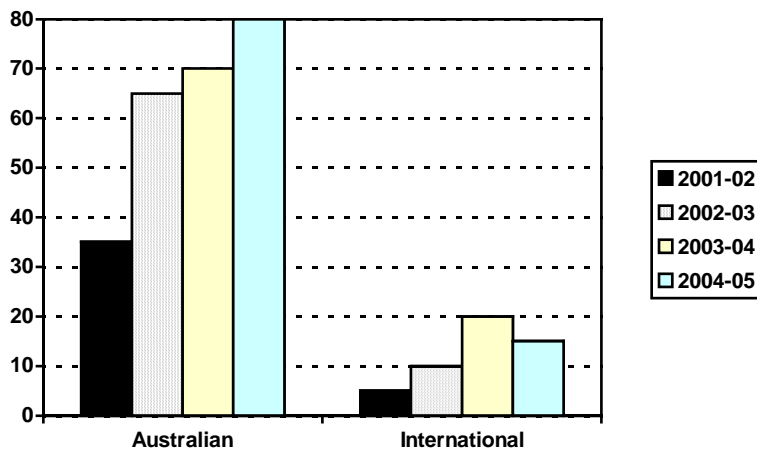


Figure 4 Awards and invited papers

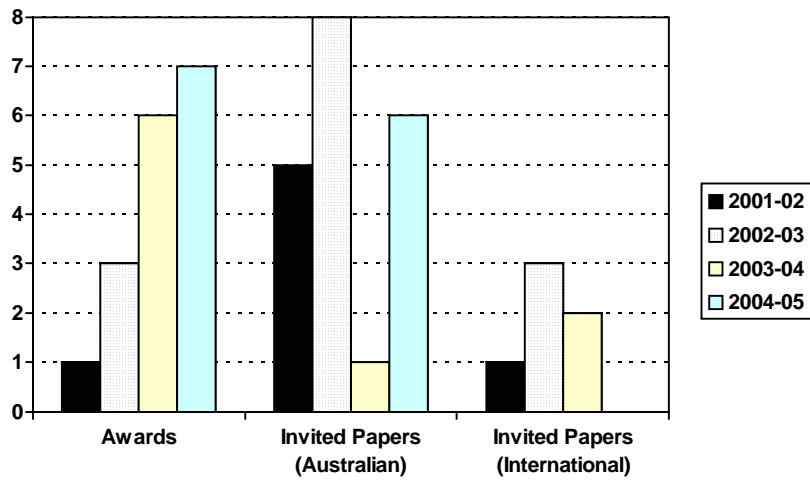


Figure 5 Number of non-university or collaborative staff involved as supervisors

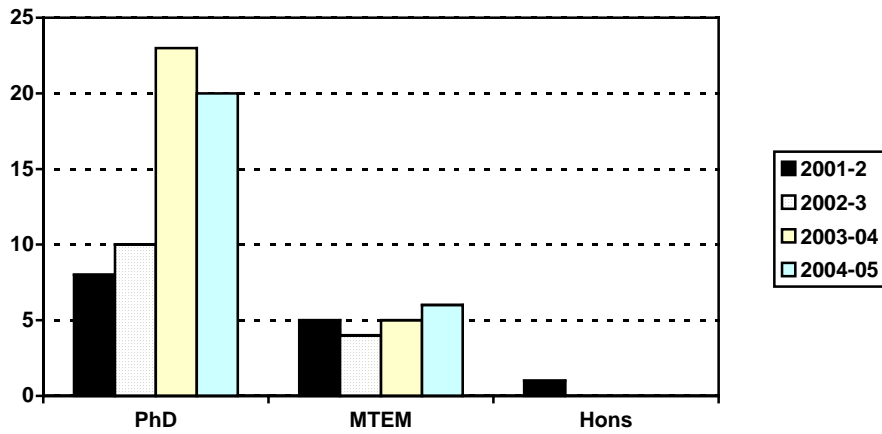


Figure 6 Media Recognition

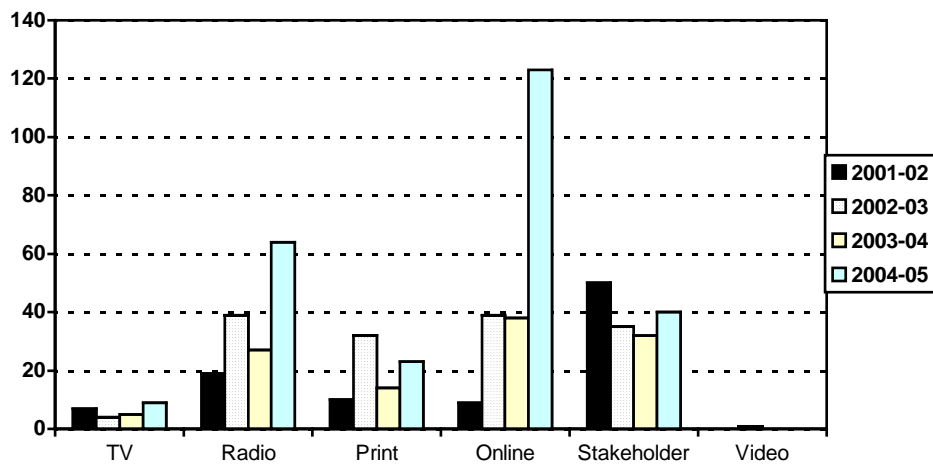
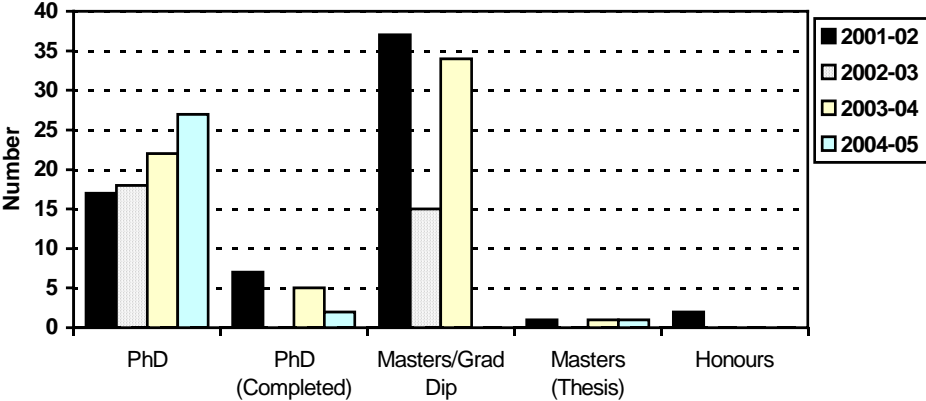


Figure 7 Number of Postgraduate Students



* Masters thesis upgraded to PhD during 2003.

Abbreviations and acronyms

AACo	Australian Agricultural Company
ACIAR	Australian Centre for International Agricultural Research
AGO	Australian Greenhouse Office
ANU	Australian National University
APCC	Animal and Plant Control Commission of South Australia
BCYDC	Balkanu Cape York Development Corporation
BFCNT	Bushfires Council of the Northern Territory
BRAC	Barkly Region Advisory Committee
CALM WA	Department of Conservation and Land Management, Western Australia
CAEPR	Centre for Aboriginal Economic Policy Research (Australian National University)
CARE	Centre for Agricultural and Resource Economics
CFCU	Caring for Country Unit
CDU	Charles Darwin University
CIFOR	Centre for International Forestry Research
CLC	Central Land Council
CLMA	Centralian Land Management Association
CSIRO	Commonwealth Scientific Industrial Research Organisation
CSIRO L&W	CSIRO, Division of Land and Water
CSIRO SE	CSIRO, Sustainable Ecosystems
CSIRO TERC	CSIRO, Tropical Ecosystems Research Centre
CYP	Cape York Peninsula
DCC	Darwin City Council
DK-CRC	Desert Knowledge CRC
DoD	Department of Defence
DoGS	Australian Deans of Graduate Studies
DOLA WA	Department of Land Administration, Western Australia
DUBDC	Desert Uplands Build-Up and Development Committee
EA	Environment Australia
ECNT	Environment Centre NT
EFTSU	Equivalent full-time student unit
EPA (Qld)	Queensland Environmental Protection Agency
GIS	Geographic Information System
GLM	Grazing Land Management
ICAT	(International) Centre for Appropriate Technology
ILC	Indigenous Land Corporation
JCU	James Cook University
KALACC	Kimberley Aboriginal Law and Culture Centre
KAPA	Kimberley Aboriginal Pastoralists Association
KCTWM	Key Centre for Tropical Wildlife Management
KCC	Katherine City Council
KLC	Kimberley Land Council
KPIAC	Katherine Pastoral Industry Advisory Committee
LCNT	Landcare Council of the NT
LWA	Land & Water Australia
MODSIM	International Congress on Modelling and Simulation
MIM	Mount Isa Mines Pty Ltd
MLA	Meat & Livestock Australia
MTEM	Master of Tropical Environmental Management
NABRC	North Australian Beef Research Council
NAFMF	North Australia Fire Managers' Forum

NAILSMA	North Australian Indigenous Land & Sea Management Alliance
NAPCO	North Australian Pastoral Company Pty Ltd
NASA	National Aeronautics and Space Administration (USA)
NASDA	Japanese Space Development Agency
NGRMG	Northern Gulf Resource Management Group
NHT	Natural Heritage Trust
NLC	Northern Land Council
NLC CFCU	Northern Land Council Caring for Country Unit
NLWRA	National Land and Water Resources Audit
NRM	Natural resource management
NTCA	Northern Territory Cattlemen's Association
NT DEET	Northern Territory Department of Employment, Education and Training
NT DPIF&M	Northern Territory Department of Primary Industries, Fisheries and Mining
NT DNRETA	Northern Territory Department of Natural Resources, Environment and the Arts
PAN	Parks Australia North
QCC	Queensland Conservation Council
QDPIF	Queensland Department of Primary Industries and Fisheries
QDNRM&E	Queensland Department of Natural Resources, Mines and Energy
QFRA	Queensland Fire and Rescue Authority
QPWS	Queensland Parks and Wildlife Service
RGSQ	Royal Geographic Society of Queensland
RIRDC	Rural Industries and Research Development Corporation
RS	Remote sensing
SAC	Savanna Advisory Committee
SME	Small to Medium Enterprises
SPAG	Scientific Program Advisory Group
TEM	Tropical Environmental Management
TS-CRC	Tropical Savannas Management Cooperative Research Centre
UQ	University of Queensland
VRD	Victoria River Downs / District
VRDCA	Victoria River District Conservation Association
WA FESA	Western Australia Fire and Emergency Services Authority
WWF	World Wide Fund for Nature