



Research



This year the Centre has seen many projects reach their fourth year of operation and a significant number of outputs produced in the form of scientific journal articles, research and technical reports, workshop proceedings and contributions to the *Issues in Tropical Rainforest Landscapes* series.

Several new or reconstituted programs, including Program 10 *Catchment to Reef* with CRC Reef and associated projects, were approved by the Rainforest CRC Board to commence in the 2003/2004 year. These exciting new initiatives addressed a number of critical research needs raised by researchers and research users at several workshops and summits held throughout the previous year.

The *Catchment to Reef* program, led by Professor Richard Pearson (JCU), consists of seven tasks (projects), with the overall goal being the development of tools required by landholders, industry and other stakeholders to monitor the effects of land-use change and restoration of water quality in the Wet Tropics World Heritage Area and Great Barrier Reef lagoon.

Program 1 researchers, led by Professor Geoff McDonald (CSIRO), have been heavily committed to the preparation of the Wet Tropics Natural Resource Management (NRM) Plan. The Plan will provide direction to future funding and prioritise investment from a range of sources, most notably through the Natural Heritage Trust Phase 2 Program. The NRM planning process includes the incorporation of Indigenous interests and aspirations. The Indigenous NRM planning approach has gained nation-wide interest and praise.

Drs David Hilbert (CSIRO) and Steve Williams (JCU) commenced an exciting project within Program 2 examining impacts of climate change on rainforest ecosystems and biodiversity. This research has put the Rainforest CRC at the forefront in understanding the determinants of tropical biodiversity and conservation planning, and produced outcomes of international significance in many areas of global change ecology and conservation biology.

The new Program 3, led by Professor Roger Kitching (GU) has brought together research on canopy processes and dynamics. Project 3.1 continued earlier work from Program 6 on floral-insect interactions in the rainforest canopy at the Australian Canopy Crane Research Facility site. Project 3.2 examined seasonal changes in forest canopy carbon, heat and water fluxes at the crane site. This research provides the Rainforest CRC with direct links to the Global Canopy Program and national (Ozflux) and international (Fluxnet) flux networks.

Program 4, led by Professor David Gillieson (JCU), continues to focus on issues associated with rainforest access, including visitation, roads and other linear infrastructure. The strategic alliance with Queensland Department of Main Roads has also added considerable value to this program. Project 4.3 commenced during the 2003/2004 year with the aim of introducing appropriate remote sensing methodologies to enhance environmental monitoring and impact assessment in the Wet Tropics.

Researchers from Program 5, led by Associate Professor Carla Catterall (GU), have played an active role in communicating their research with community and external organisations. Research from Project 5.1 on forest restoration and rehabilitation has been shared with agencies such as The World Conservation Union and the Food and Agriculture Organisation of United Nations (Asia Office). A new computer package was developed under Project 5.3 – the Australian Farm Forestry Financial Model – which is undergoing final review before it is released as a CD-ROM.

Several new projects commenced within Program 6, led by Dr David Westcott (CSIRO). The successful study of spectacled flying-foxes provides an excellent example of researchers and stakeholders working together for conservation and production objectives. A study of impacts of climate change on rainforest marsupial folivores is attempting to develop distributional models for these rare animals based on mechanisms limiting their present distribution.

Program 7, led by Dr Sandra Pannell (Rainforest CRC), continues to play a significant role in Aboriginal collaboration and capacity building in research. New initiatives included the preparation of an environmental history of Najadjon-Jii Country and community and a technical education and training project with the Ma:Mu people on participatory domestication of native food plants.

Research for the 2003/2004 year is summarised for each program in the form of an introductory paragraph, which outlines major achievements for each project. Selected research from each program is featured, followed by progress against milestones for each project.

Program 1

Regional Planning and Management

Program Leader – Professor Geoff McDonald (CSIRO)

Program 1 applies innovative research to provide tools for the effective planning and management of sustainable development in tropical forest regions.

This year, Project 1.1 completed the draft regional Natural Resource Management (NRM) Plan for the Wet Tropics World Heritage Area, a process that involved two years of intensive community consultation and collaboration with public and private stakeholders. Project 1.2 completed trial processing of MODIS work for environmental monitoring and continued work on designing a regional information system. Development of an Aboriginal Cultural and Natural Resource Management Plan continued in Project 1.4 to ensure Aboriginal interests are represented in the regional plan produced by Project 1.1. Traditional Owners have actively participated in the two-year consultation and negotiation process to develop the Aboriginal Plan, which is due to be finalised by the end of 2004.



NRM Plan Approaches Final Stages

In 2002, researchers from Project 1.1 and the Wet Tropics regional NRM body (now FNQ NRM) joined forces to prepare a new regional NRM plan under State and Commonwealth Guidelines. The process involved intensive community consultation and identification, collation and synthesis of information already documented in over one hundred different plans and strategies prepared for Wet Tropics coasts, catchments, endangered species, local government areas, World Heritage areas and national parks. The project produced a number of key documents during the year which were published as part of the Rainforest CRC Research Report Series:

- *Sustaining the Wet Tropics – Background Report (Vol 1)*
- *Sustaining the Wet Tropics – Condition Report: Biodiversity Conservation (Vol 2A)*
- *Sustaining the Wet Tropics – Condition Report: Sustainable Use (Vol 2B)*



Copies of the the NRM background reports may be downloaded from the Rainforest CRC website.

The draft Regional Plan was completed at the end of June and will be submitted to the State and Commonwealth accrediting bodies by the end of July.

In 2002 it was agreed that an Aboriginal Cultural and Natural Resource Management Plan would form part of the overall NRM plan for the Wet Tropics region. Progress since commencement in April 2003 has included a development process for the Plan, endorsement of a consultation strategy by Traditional Owners and over eighteen workshops with different Traditional Owners, Indigenous organisations and key regional environmental management agencies. The Proceedings of three of these workshops will be published later in the year as part of the Rainforest CRC Report series with the draft Aboriginal Plan due for completion in September 2004.

This project has provided an excellent opportunity to engage the science and planning skills of the CRC with the community. Rainforest CRC scientists have provided important scientific input into the project on topics such as water quality and management, biodiversity targets and needs, rehabilitation, Indigenous involvement, information sources, monitoring requirements. Scientific publications will be produced on relevant concepts and methods for analysing natural resource condition and trends, theoretical issues and practicalities of defining specific targets to underpin the vision of the community for the desired condition of their natural resources. The publications will also address the technical and political principles and methods that can be used to assist in defining prioritised actions that address NRM issues and meet resource condition targets.



Left: Program 1 Leader Professor Geoff McDonald (left), with Nigel Weston and Cath de Voil (Photo: Geoff McDonald)

Right: Aboriginal NRM Plan researchers, Libby Larsen (left) and Jean Fenton.

Remote Sensing at the Regional Scale

Over the past four years, researchers in Project 1.2 have developed a series of techniques that can be used by Wet Tropics land management agencies to produce baseline maps and monitor change in environmental parameters recognised as State of Wet Tropics environmental indicators.

The techniques have been developed to use both commercial and freely available image data sets within GIS and image processing software packages currently operated by Wet Tropics management agencies at local, State and Federal government levels.

Mapping and monitoring techniques have been developed for use from optical, and all-weather active (Radar) imaging systems covering: vegetation cover change, vegetation structure change, fire scar and invasive weeds (Pond apple). These techniques provide the capability to map and monitor the condition of the Wet Tropics environment and a basis for sustainable management of the region's resources. A number of workshops were held to transfer much of this methodology and experience to relevant agencies in the region and several reports were published as part of the Rainforest CRC Research Report Series.

Project 1.1 – Wet Tropics Natural Resource Management Plan

Leader: Professor Geoff McDonald, CSIRO

This project is preparing an accredited Regional NRM Plan for the Wet Tropics in partnership with FNQ NRM Ltd and its committees and stakeholders to guide future NRM investment in the region. Researchers will also build a methodology for FNQ NRM Ltd to assess priorities and rankings for the investment plan and develop the tools and knowledge base to inform decision makers about returns on alternative investments.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Draft Regional Plan.	Completed	-
Investment Plan negotiated.	Completed	-
Identify set of decision support tools.	Completed	-
Present framework to regional planning agencies.	Completed	-

Project 1.2 – Regional State of the Wet Tropics (Satellite Based) Monitoring Information System

Leaders: Dr Alex Held, CSIRO and Dr Stuart Phinn, UQ

This project is developing remote sensing applications which can be made operational for ongoing satellite based Wet Tropics monitoring along with information sets and airborne image data to meet regional and local scale monitoring and management needs of key Wet Tropics NRM management agencies. It will provide web-based monthly satellite derived information on environmental health indicators and become a repository for more detailed baseline rainforest image datasets.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Identification of regional scale monitoring information requirements.	Completion of trial processing of MODIS work and design of regional information system.	Continued development of environmental indicator mapping approaches.
Selection of suitable environmental indicators.	Completed selection of indicators to use as part of regional information system design. Specified in the reference listed above.	-



Development of web-based information system.	Completed specification of system design for delivery of maps as part of regional information system design. Specified in the reference listed above.	-
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Project 1.4 – The Aboriginal Cultural and Natural Resource Management Plan

Leaders: Professor Geoff McDonald, CSIRO and Dr Sandra Pannell, JCU

This project responds to Indigenous aspirations to be involved in the preparation of the new Wet Tropics Regional NRM Plan being developed in Project 1.1. This plan will document the cultural and natural resource management aspirations, requirements and priorities of Traditional Owners within the region.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Community engagement and information strategy.	Fifteen one-day Indigenous workshops. Three regional stakeholder workshops.	Publish Proceedings of three regional workshops.
Development of Publicity Material.	Two brochures completed.	-
Aboriginal NRM Plan Discussion Paper.	Paper circulated July 2003.	Review of process.
PowerPoint presentation on Plan and Process.	Three PowerPoint presentations developed.	-
Draft Aboriginal Plan.	First Draft Completed June 2004.	-
Final Aboriginal Plan.	To be completed September 2004.	Complete Final Aboriginal Plan.

Project: 1.5 – Developing New Economic Models for Cape York Peninsula and Northern Australia

Leader: Dr Rosemary Hill (ACF)

This project will develop models for culturally and environmentally appropriate economic activity that will provide for ongoing protection of cultural and natural diversity, while improving the quality of life of people, particularly Indigenous peoples. The project represents a partnership between the Rainforest CRC, the Australian Conservation Foundation, supported by the Wilderness Society, CAFNEC, ECNT, EK, CSIRO, Wuthathi Tribal Council Balkanu and Cape York Traditional Owners.

An Appropriate Economies Roundtable – Cape York was held over two days in November with fifty participants from a wide range of Indigenous, environment and industry groups. A framework was developed for linking the natural heritage values of Cape York Peninsula, identified through a major study released by the Queensland Government in 2001, with future economic activities. Four areas for ongoing collaborative work were agreed: reform to tenure and protected area arrangements; pilot projects; an exchange program; and the development of an Ecotrust fund for financing sustainable enterprises.

Program 2

Functional Ecology and Global Change

*Program Leader: Dr Paul Reddell, CSIRO (to December 2003)
Dr David Hilbert, CSIRO (from December 2003)*

Program 2 researchers are identifying and quantifying some of the key biophysical ecosystem services provided to the community by north Queensland rainforests so that impacts of changing land use and climate can be evaluated and incorporated into regional planning.

Project 2.2 began work this year on assessing the hydrological factors controlling the distribution of remnant coastal vegetation on three sites with different coastal vegetation types (palm swamp, melaleuca swamp and coastal dune forest). Initial results show that forest types subject to periodic inundation may in fact act as filters for water moving through them. Project 2.4 finished in April 2004 with data collection on rainforest insects completed and research papers to be submitted within the next six months. Climate change work undertaken in Project 2.5 received significant media exposure during the year when a State Government commissioned report on the effects of climate change on terrestrial biodiversity in Queensland was released in March 2004.

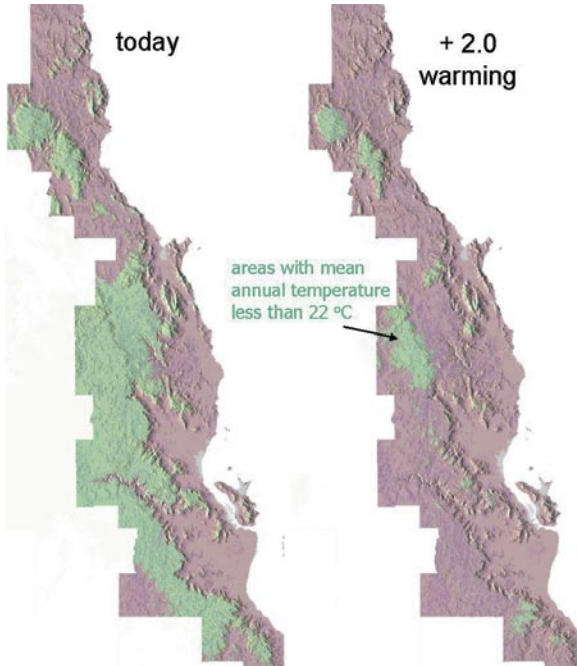


Climate Change – The Hot Issue

Research about the environmental outcomes of climate change from Project 2.5 has significantly increased awareness of the possibly catastrophic loss of plant and animal biodiversity associated with future warming in the Wet Tropics World Heritage Area.

Modelling of the potential impacts of warming on Wet Tropics vertebrates has demonstrated a considerable threat to endemic species in the region. This, along with models of impacts on forest classes, has contributed to global, national, state, and regional analyses of climate change impacts and to the development of policy initiatives both in Queensland and at the federal level. Results have been used to help to form environmental policy at regional, state, national and international levels.

Project 2.5 Leaders Dr David Hilbert and Dr Steve Williams were among a panel of experts attending a Climate Change Forum in Brisbane in July 2003, and their work formed an integral part of a report to government, which followed in January 2004. The report entitled *Environmental Crisis: Climate Change and Terrestrial Biodiversity in Queensland* was published as part of the Rainforest CRC Research Report Series and widely distributed both in print and electronically. Release of the report received significant media attention and both researchers have been important contributors to a number of other publications on climate change. High impact publications in *Nature* by Dr Williams have elevated the issue of potential species extinctions to a high level internationally.



Areas in the Wet Tropics with mean annual temperatures less than 22°C (green) in today's climate (left) and after 2°C warming



letters to nature

Extinction risk from climate change

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Climate change over the past 30 years has produced unexpected shifts in the distributions and abundances of species¹ and has been implicated in one species-level extinction². Using projections of species' distributions for future climate scenarios, we assess extinction risks for sample regions that cover some 20% of the Earth's terrestrial surface. Employing three approaches, we find that the estimated probability of extinction shows a positive relationship with geographical range size, we predict on the basis of mid-range climate-warming scenarios for 2030, that 15–27% of species in our sample of regions and taxa will be 'committed to extinction'. When the average of the three methods and two dispersal scenarios is taken, we predict climate-warming scenarios produce lower probabilities of species committed to extinction (1–19% than mid-range (2–27%) and maximum change (3–35%) scenarios. These estimates show the importance of rapid implementation of technologies to decrease greenhouse gas emissions and strategies for carbon sequestration. The responsiveness of species to recent³ and past⁴ climate change raises the possibility that anthropogenic climate change could act as a major cause of extinctions in the near future, with the Earth not becoming more than a step-warm in the past 30 years (ref. 5). Here we use projections of the future distributions of 1,200 animal and plant species to provide 'first-past' estimates of extinction probabilities associated with climate change scenarios for 2030.

For each species we use the modelled association between current distributions (such as temperature, precipitation and seasonality) and present-day distributions to estimate current distributional area⁶. This 'climate envelope' represents the conditions under which populations of a species currently persist in the face of competitors and natural enemies. Future distributions are estimated by assuming that current envelopes are retained and can be projected to future climate scenarios⁷. We assume that a species either has no limits to dispersal such that its future distribution is the entire area predicted by the climate envelope model or that it is incapable of dispersal, in which case the new distribution is the overlap between current and future potential distributions (for example, species with little dispersal or that inhabit fragmented landscapes⁸). Finally for most species in which we fall between these extremes.

We explore three methods to estimate extinctions, based on the species-area relationship, which is a well-established empirical power-law relationship describing how the number of species relates to area ($S = cA^z$, where S is the number of species, A is area, and c and z are constants⁹). This relationship predicts adequately the numbers of species that become extinct or threatened when the area available to them is reduced by habitat destruction¹⁰. Extinctions arising from area reductions should apply regardless of whether the cause of distribution loss is habitat destruction or climate unsuitability.

Because climate change can affect the distributional area of each species independently, classical community-level approaches need to be modified (see Methods). In method 1 we use changes in the current distribution area of all species. This is consistent with the traditional species-area approach on average, the destruction of half of a habitat results in the loss of half of the distribution area summed across all species restricted to that habitat. However, this analysis tends to be weighted towards species with large distributional areas. In addition, this method 2 we use the average proportional loss of the distributional area of each species to estimate the fraction of species predicted to become extinct. This approach is suitable for the species-area relationship because halving the habitat area leads on average to the proportional loss of half the distributional area of each species. In method 3 we consider the extinction risk of each species to zero. In classical applications of the species-area approach, the fraction of species predicted to become extinct is equivalent to the mean probability of extinction per species. Thus, in method 3 we estimate the extinction risk of each species separately by substituting its area loss in the species-area relationship, before averaging across species (see Methods). Our conclusions are not dependent on which of these methods is used. We use $z = 0.25$ in the species-area relationship, the value given in our previous research on predicting proportions of threatened species¹¹, but our qualitative conclusions are not dependent on this or any other parameterisation. At three sites gaps in the data for all dispersal climate scenarios were available for each region, a high-resolution model is fitted to the extinction risk data to produce estimates for missing values in the extinction risk table (Table 1). Balanced estimates of extinction risk, averaged across all data sets, can then be calculated for each scenario.

For projections of maximum expected climate change, we estimate species-level extinction across species included in the study to 20–32% for no dispersal (Table 1). For projections of mid-range climate change, extinction rates are 14–20% with dispersal and 15–20% without dispersal (Table 1). Estimates for minimum expected climate change are 3–5% with dispersal and 3–5% without dispersal. Projected extinction varies between parts of the world and between the three dispersal scenarios (Table 1), but our estimates are affected by the data available. The species-area methods differ from one another by up to 1.8-fold (method 1 versus method 2) in estimated extinction, whereas the two dispersal scenarios produce a 1.8-fold difference, and the three climate scenarios produce a 1.6-fold difference.

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Nature adopted the Boyd's forest dragon of Australia for its January 2004 issue, which highlighted climate change research by Dr Steve Williams.

Project 2.2 – Water Regulation as an Ecosystem Service

Leaders: Dr Paul Reddell, CSIRO (to December 2003)

Dr David McJannet, CSIRO (from December 2003)

This project is evaluating the hydrological consequences of land cover and climate change on water yield from Wet Tropics catchments. Work includes quantification of the role of mountain cloud forests in regional hydrology, water use and regulation by different forest types and an assessment of the vulnerability of specific forest types to changes in local hydrology.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Development of detailed project description in consultation with PSG.	Project plan outlined for PSG at last meeting and support for the research was expressed.	Preliminary assessment of importance of groundwater to functioning of major coastal forest types.
Selection of coastal forest research sites for seasonal water balance measurements.	Coastal field sites have been identified at Cowley Beach, Euramo and Noah Beach and permits for research have been obtained.	Preliminary assessment of measuring and sampling techniques for determining water use of palm trees.
Determine location of existing coastal groundwater wells, collate existing data and determine potential to instrument key existing wells.	Coastal groundwater well information gathered. Location and potential use of these wells is now being assessed.	-
Complete instrumentation of first sites for water balance studies.	Coastal field sites at Cowley Beach, Euramo and Noah Beach have been instrumented to measure tree water use, groundwater fluctuations, soil moisture and climate variables.	-

Project 2.4 – Ecological Services Provided by Rainforest Arthropods

Leader: Dr Saul Cunningham, CSIRO

The processes of pollination, biological control of pests and herbivory in production systems adjacent to and far from rainforest have been examined in this project to determine the services, dis-services and their economic significance to agriculture and forestry which emanate from rainforest arthropods.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Field work	Complete	-
Final analysis and write up	Papers in preparation	-
Economic evaluation	Scientific publications planned	-



Project 2.5 – Impacts of Climate Change on Rainforest Ecosystems and Biodiversity

Leaders: Dr David Hilbert, CSIRO and Dr Steve Williams, JCU

This project is providing the critical information and tools required for management plans aimed at the conservation of rainforest ecosystem processes and biodiversity in the face of rapid, unprecedented climate change.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Establish altitudinal monitoring sites, place data loggers and conduct first round of sampling.	Sites established, initial sampling completed, some data loggers installed on-site.	Distribution models for key selected taxa/processes that incorporate climate change predictions and biotic processes.
Fill in obvious gaps in broad regional sampling across the altitudinal gradient.	Gaps continue to be filled in ongoing work.	Completion of second year of field sampling/monitoring.
Preliminary analysis on climate change refugial areas based on existing data.	Several analyses completed or underway.	-
Identification of subsets of sites for ongoing long term monitoring and evaluation of taxon.	Two long term monitoring transect established across the altitudinal gradient on the Atherton Tableland and Carbine Tableland.	-



Left: Mark Disher checks heat pulse instrumentation for measuring water use of inundated Melaleuca swamp at Cowley Beach.

Below: Dave McJannet checks weather and groundwater monitoring instrumentation at inundated coastal forest at Cowley Beach.



Program 3

Canopy Processes and Dynamics

Program Leader: Professor Roger Kitching, GU

Program 3 utilises the Australian Canopy Crane Research Facility at Cape Tribulation to study processes that take place in the rainforest canopy.

This year Project 3.1 concluded work from a prior project (6.4) and began mapping target tree species within one square kilometre at the crane site, completed DNA extraction for two species and are currently perfecting techniques for the analysis of cambium. The project also hosted a highly successful field day at the Australian Canopy Crane to establish linkages with both end users and showcase project results. The third successive year of carbon, heat and water flux data collection was finalised by Project 3.2 with surprising results that attracted ABC television coverage on *Catalyst* and several newspaper reports including *Reuters*.





Equipment used in Project 3.2 research on carbon flux in the Daintree rainforest.

From Sink to Source

For the past three years, researchers have collected baseline data on carbon, heat and water exchanges at the canopy crane site. Carbon, sensible and latent heat fluxes above the forest canopy were measured using the Eddy Covariance method. Xylem sap-flow measurements were carried out to provide detail on the transpiration characteristics of several major trees in the plot and the soil flux was measured using a closed chamber method.

Standard micrometeorological instrumentation mounted on the crane tower was used to measure climatic variables with an all-weather meteorological station providing data for the site. The overall strategy of the project was to minimise the amount of user intervention and once an optimal operational configuration was achieved, regular maintenance and downloading of data from the instruments was the major experimental action required with data analysis then carried out at James Cook University in Cairns.

Data collection was completed at the end of March 2004, however the software used for data collection and processing was significantly refined in 2003 which allowed some preliminary analysis of results to be carried out towards the end of that year. Analysis showed that during the two very dry years in 2002 and 2003, the forest changed from a 'sink' to a source of carbon dioxide to the atmosphere. This result was so unexpected that it attracted a number of newspapers, including international newspapers, and the story featured on the ABC television program *Catalyst*.

This knowledge has contributed considerably to our understanding of how tropical forests respond to drought conditions and has significant implications. Under conditions with less available water, which is the prediction under most GCM models for far north Queensland, the mesophyll vine forest at Cape Tribulation changed from a carbon sink to a carbon source over a two year period. If it can be generalised to other tropical forest types then it implies that there is a major new source of carbon to be accounted for - forests placed under climatic stress.





Insert: Program 3.2 researchers Associate Professor Steve Turton (left) and Dr Michael Liddell, checking carbon flux equipment on the Canopy Crane. The rainforest canopy at the Canopy Crane site.

Project 3.1 – Floral Biology and Canopy Pollination in Fragmented Forests

Leader: Professor Roger Kitching, GU

Working from the canopy crane, this project explores the response of rainforest pollination systems to fragmentation. Researchers are working on the biology of specific pollinator species and their multifunctional roles in the canopy, community ecology of the flowering process and parentage amongst and variability of small or isolated plant communities.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Submission of draft papers.	Three manuscripts in review.	Parentage analysis for one target species.
Mapping of tree locations.	Mapping of all target trees complete the end of July.	Visitor surveys across fragmented landscape for two plant species.
Development of primer for one species.		Workshop to review pollination of Australian rainforests.

Project 3.2 – Net Ecosystem Exchange of Carbon, Heat and Water in a Tropical Rainforest

Leader: Dr Michael Liddell, JCU

Using non-destructive techniques, this project uses instrumental methods to study the fluxes of carbon, heat and water above and below the rainforest canopy to advance the knowledge of these key indicators of overall ecosystem productivity.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Compendium of data assembled from third complete year of operation of EC system.	Significant press coverage on the flux study (TV, newspaper, Web).	Publication of first major paper on EC measurements at Cape Tribulation. Early/Mid 2005.

Program 4

Rainforest Access: Managing and Monitoring Impacts

Program Leader: Professor David Gillieson

rdwalk →
ion South
Beach →

Program 4 is concerned with the effects of visitation and usage on the Wet Tropics World Heritage Area with research being conducted on ways to mitigate the natural and cultural impacts that result from these. Best practice guidelines are being developed for tourism, recreational activities, roads, powerlines and walking tracks.

Progress this year under Project 4.1 includes the finalisation of a summary version of results from major site and community surveys based in the Wet Tropics World Heritage Area. A second project, currently underway, focuses on the evaluation of the Mossman Gorge Community Plan, 2001, aimed at complementing and extending the Plan through updating relevant sections and evaluating progress made to date. Work in Project 4.2 continued to examine impacts of roads and powerlines on microclimate, floristics, vegetation structure, seedling dynamics and mammals and provide advice to the Main Roads Department, power utilities and environmental management agencies. Project 4.3 created a seamless air photo mosaic of the Douglas Shire at two scales and used a novel technique involving field surveys, GIS data extraction from classified imagery and statistical analysis to determine canopy connectivity across the Kuranda Range Road. Project 4.4 continued the development of culvert fishways to be adopted by local government agencies in the region.

Project 4.1 Wet Tropics Community Surveys

“The information from the community and visitor surveys is very important to the Authority and its management of the Wet Tropics World Heritage Area. The Rainforest CRC has helped to develop an extensive database that assists the Authority to monitor how well it has engaged the community in giving the World Heritage Area a role in the life of the community. Monitoring of visitor sites is particularly important to ensure that sites are managed as outlined in the Nature-based Tourism Strategy, and is providing valuable information on the experience sought by visitors at different sites.”

Russell Watkinson, Executive Director
Wet Tropics Management Authority



An example of a regrowth plot in a powerline clearing, planted in 2000, which has been monitored by Project 4.2 researchers (Photo: Miriam Goosem)



Faunal underpasses (right) assist medium-sized rainforest mammals to travel through segmented areas and (above) a pademelon is photographed using an underpass by an infrared triggered camera (Photos: Jonathan Munro and Miriam Goosem)

Roads and Powerline Impacts

Since 1999, Project 4.2 has focused on mitigating the impacts of roads, powerline clearings and other linear infrastructure on the rainforest environment through applied research, and the provision of advice and best practice environmental design and maintenance for rainforest roads and powerlines to infrastructure agencies and managers. The project’s priority is cost effective mitigation methodology to encourage incorporation of Rainforest CRC research into linear infrastructure design, upgrades and maintenance in the Wet Tropics.

Along highway, road and powerline clearings in the Palmerston area, research is being conducted into edge effects on microclimate, floristics, vegetation structure, seedling dynamics and medium-sized mammals. Using GIS techniques, models are being created to demonstrate the degree to which edge effects penetrate and disturb rainforest of the entire Wet Tropics World Heritage Area. The degree to which movements of medium-sized rainforest mammals are affected by a highway is also under investigation. Traffic noise penetration through the rainforest canopy is being measured, and birdsong analysed to determine whether traffic noise affects bird communication.

The effectiveness of mitigatory strategies for road mortality, linear barrier and edge impacts of powerline clearings and roads are being monitored in East Evelyn faunal underpasses and revegetation corridors as well as the Palmerston powerline clearing. Potential impacts of linear clearings on the habitat quality and degree of connectivity provided by remnant riparian vegetation is under examination in the agricultural landscapes of the Douglas Shire. The degree of heavy metal contamination of gutter sediments, soils and roadside grasses has been determined at sites between Cairns and Kuranda, and substances tested for their potential to prevent waterway contamination by contaminant removal from road runoff. Project researchers respond to requests from the Department of Main Roads and environmental management agencies with verbal advice, reports on design and best practice, and presentations.



Project 4.1 – Strategies for Sustainable Rainforest Visitation and Use

Leader: Dr Joan Bentrupperbäumer, JCU

Integrating both natural and social science perspectives, this project implements an agenda for continuing long term research on psychosocial and biophysical impacts and changes from visitation and use in the Wet Tropics World Heritage Area that are relevant to protected area conservation and management.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Best Practice Manual: Assessing the impacts of visitation and use in World Heritage Areas in Australia.	Completion of WTWHA site level reports and community survey reports.	Site level research: crowding and carrying capacity, risk communication and warning messages, natural and cultural heritage interpretation.
Mapping of tree locations.		Roads research: changing driver behaviour.

Project 4.2 – Sustainable Roads, Powerlines and Walking Tracks

Leaders: Dr Miriam Goosem, JCU and Professor David Gillieson, JCU

The impacts of linear infrastructure, including highways, roads, powerlines and walking tracks, on the biophysical environment of the Wet Tropics bioregion are being assessed within this project and indicators developed to allow for their monitoring. Impacts on microclimate, flora, fauna, soil and water are being examined.

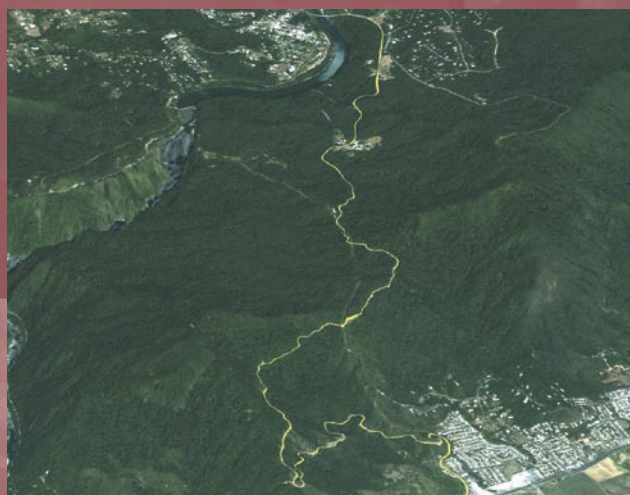
Milestones 03/04	Achievements 03/04	Milestones 04/05
Best Practice Manual for Main Roads.	Best practice manual close to completion. Kuranda Range design review completed.	Faunal underpasses evaluation at East Evelyn and Mission Beach continue, East Evelyn revegetation evaluation completed.
Completion of weed surveys.	Floristic edge effects sampling on two edge types completed.	Impacts of linear clearings on seed dynamics completed.
Completion of impacts of powerline clearings and restoration on reptiles and frogs.	Honours thesis completed.	Impacts of linear infrastructure on riparian vegetation completed.
Heavy metal contamination along highways and waterways, mitigation.	Sampling and laboratory analyses continuing.	Sampling and mitigatory strategies for highway contaminants completed.
Impacts of roads on medium sized mammals sampling commenced.	Sampling ongoing.	Impacts of linear clearings on medium sized mammals sampling complete.

Project 4.3 – Improving GIS Models of Ecological Impacts Using High Resolution Remote Sensing

Leader: Professor David Gillieson (JCU)

High resolution airborne and satellite imagery is used in this project to map and identify small patches of changing vegetation along powerline, road and stream corridors as researchers investigate the utility of these new technologies for mapping rainforest margin disturbance zones and their recovery.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Study site definition, image acquisition, pilot field survey methods.	Programmed IKONOS satellite for 2004 image acquisition over Kuranda region. Acquired 2003 archival imagery over Palmerston area. Set out network of ground control points (GCP) for ongoing image orthorectification. Canopy connectivity survey of Kuranda Range road completed.	Main field survey period – roads and powerline corridors, pilot study riparian corridors.
Image correction and rectification, DEM creation, prelim spectral data analysis	Developed new orthorectification method employing DEM and OrthoWarp software, results in RMS error less than 1m. Developed pan sharpening technique to produce 1m multispectral imagery from 4m IKONOS data. Created seamless air photo mosaic of Douglas Shire at two scales (1:25,000, 1:12,000) for riparian forest health survey. Carried out remote sensing and GIS analysis of canopy connectivity across Kuranda Range Road. Commenced entry of Program Four research data into ANZLIC standard metadata forms, will provide searchable database of program research results.	Workshop on preliminary results.



Kuranda Range road connectivity overlain on visualisation of terrain and rainforest vegetation (Image: Les Searle)

Program 5

Restoration Ecology and Farm Forestry

Program Leader: Associate Professor Carla Catterall (GU)

Program 5 is developing techniques to optimise the biodiversity values at reforested and farm forestry sites to provide guidelines for planning the role of reforestation within sustainable multi-use landscapes.

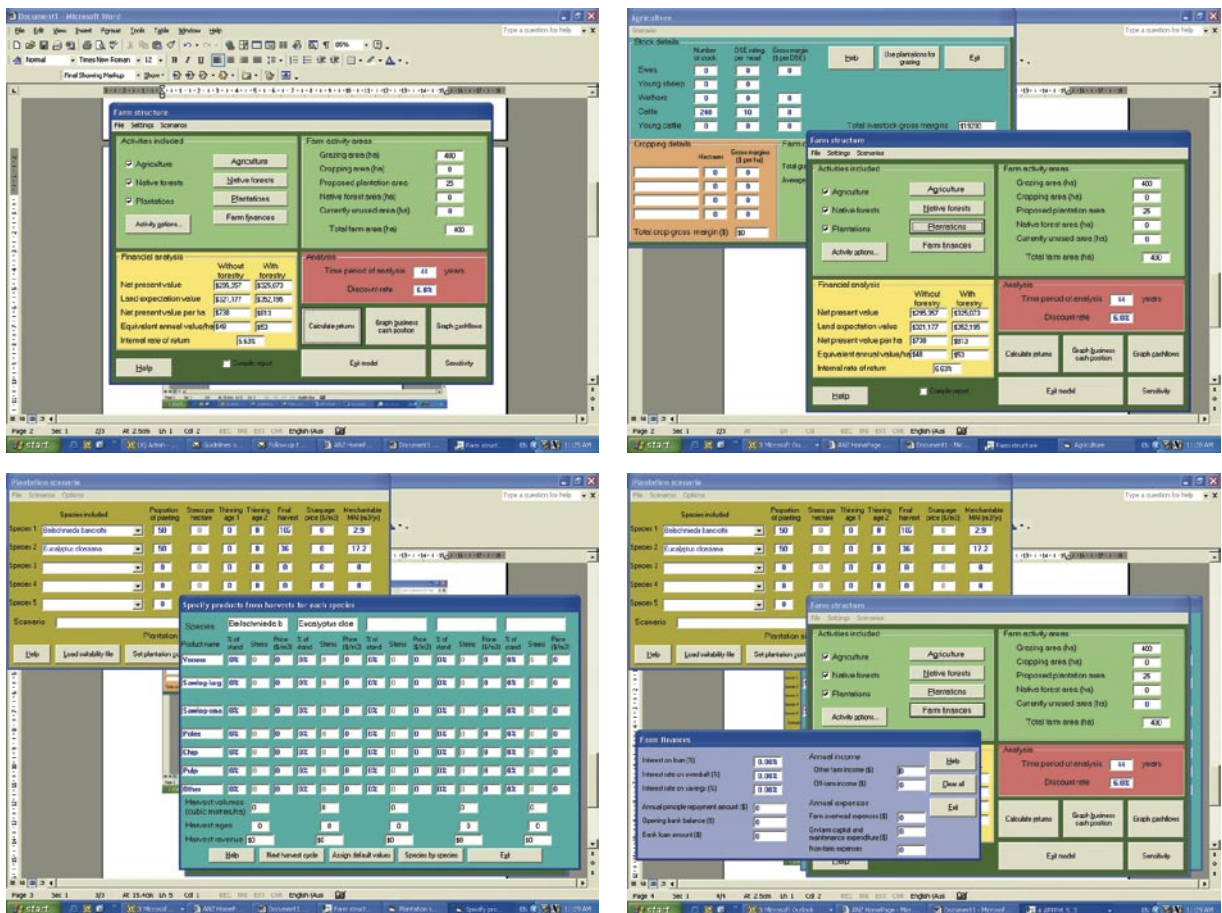
Project 5.1 has completed an initial assessment of carbon sequestration in plantation areas using a chronosequence of hoop pine plantations of various ages, and has commenced work on an edited book featuring the current state of knowledge on reforestation in the tropics and subtropics of Australia using rainforest tree species. Project 5.2 has continued work on methods for quantifying terrestrial biodiversity values of reforestation, an assessment of trade-offs between biodiversity and production values in timber plantations and development of a toolkit for practical assessments of site-based biodiversity values. A training session on the Australian Farm Forestry Financial Model (AFFFM) was held by Project 5.3 and a CD model of the computer package prepared. A timber marketing workshop and forestry industry workshop were held and proceedings from these will be published as part of the Rainforest CRC Research Report Series.

Australian Farm Forestry Financial Model

The Australian Farm Forestry Financial Model is a recent outcome for researchers Dr John Herbohn, Mr Nick Emtage and Dr Steve Harrison of The University of Queensland, following extensive research into the options available to small-scale farm forestry investors.

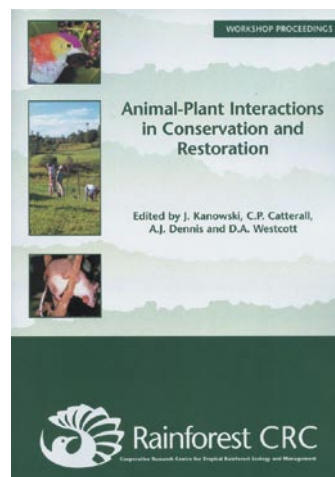
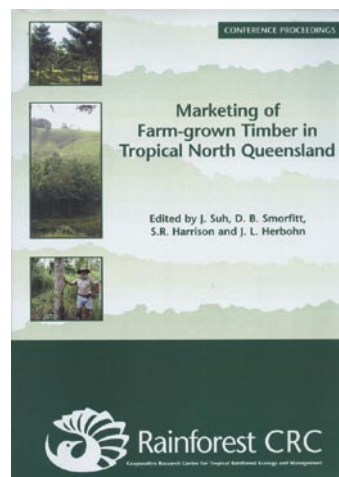
Included in the AFFFM are substantial datasets for establishment and maintenance costs, growth rates and potential timber products of a number of tree species for north Queensland, southeast Queensland and northern New South Wales.

For landholders, the decision to take up farm forestry is a major investment decision – a decision that, for many, is only undertaken once in lifetime. The AFFFM is a user-friendly, powerful tool for the financial appraisal of farm forestry options. The Model uses discounted cashflow analyses to provide users with a variety of measures of the financial performance of a hypothetical farm enterprise, comparing the financial performance of a farm with and without forestry activities.



Screenshots of the Australian Farm Forestry Financial Model software.

Recent reports from Program 5 include two workshop proceedings, *Animal-Plant Interactions in Rainforest Conservation and Restoration*, and *Marketing of Farm-grown Timber in Tropical North Queensland*, both available from the Rainforest CRC website



Project: 5.1 Restoration Techniques

Leader: Associate Professor David Lamb, UQ

This project is developing methods of reforestation suitable for ecological restoration as well as new forms of farm forestry suitable for tropical landscapes. The aim of the farm forestry research is to develop systems that yield commercial timber production as well as increased levels of biodiversity.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Establish field trial to allow for physiological measures and explore the functional consequences of diversity.	Field trial died as a result of frost events and herbivory by feral deer – alternative sites found to begin evaluation.	Complete work on optimizing rehabilitation at a landscape scale.
Workshop to review previous tree planting in north Queensland.	Workshop completed successfully and subsequent peer reviewed book on “Reforestation in the tropics and sub-tropics of Australia using rainforest tree species” close to conclusion.	-
Prepare report on direct seeding studies.	Thesis on direct seeding studies completed.	-
Complete preliminary studies of soil carbon in stand age sequence.	Preliminary studies on hoop pine and pasture reference sites for soil carbon completed.	Complete work on soil carbon in mixed species stands.
Complete initial studies on physiological attributes of contrasting farm forestry species.	Due to the trial failure initial physiological tests are only now beginning.	Complete initial studies on physiological attributes of contrasting farm forestry species.
Complete initial stand measurements for assessing functional consequences of biodiversity.	As the field trial designed for these assessments was heavily influenced by frost this milestone could not be addressed. Alternatives are being explored.	-

Project 5.2 – Biodiversity Values and Landscape Context in Reforestation

Leader: Associate Professor Carla Catterall, GU

Within the spectrum from rainforest restoration to farm forestry, this project is developing techniques for optimising biodiversity values and providing scientifically-based guidelines and examples for planning and documenting the role of reforestation within ecologically sustainable multiple use landscapes.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Quantifying biodiversity values of reforestation (QBVR).	Progress was made with data analyses and outputs.	Difference among reforested, native and deforested sites quantified for further selected terrestrial taxa Biodiversity monitoring toolkit.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Landscape Context - vegetation cover and context data and analyses of relationships with biodiversity attributes.	Landscape data measured for QVBR sites, analyses in progress. One MPhil and one Hons thesis submitted, progress on two PhDs. Three conference presentations; three papers published, one paper in press.	Two PhD projects near-complete; further manuscripts prepared for publication.
Plant-animal interactions in regeneration dynamics – continued progress and new subproject design.	Hons thesis submitted, progress on two PhDs. Seven conference/workshop presentations; three papers published, one in press. Sites selected and data collection underway for project on rainforest regeneration in subtropical weedy regrowth.	Further manuscripts prepared for publication. Complete data collection and analysis for weedy regrowth project. One PhD project near-completion, one advanced.
Reforestation audit – Wet Tropics Regional Directory.	Public-access website on reforestation and natural resource management projects updated; several consultations with user groups.	Publish report on rainforest restoration activities in Australia's tropics and subtropics.

Project 5.3 – Social and Economic Aspects of Reforestation

Leader: Dr John Herbohn, GU

Both basic and strategic research into key socio-economic issues associated with trees in tropical landscapes is being undertaken in this project, which is developing a strategic vision and business plan for the expansion of small-scale forestry in north Queensland.

Milestones 03/04	Achievements 03/04	Milestones 04/05
*Hoop Pine Expansion Business Plan.	Proposal submitted to ATSRAC, no decision yet made. Financial analysis of Hoop Pine production.	Completion of supply chain analysis for timber industry based on mixed species plantations
MODSS for farm forestry in NQ.	Analysis and report continuing.	
Further development of AFFFM.	User-friendly version produced; training workshop being conducted.	Distribution of model.
Forest Industry Development model.	Workshop held with approx. forty forestry experts. Report being prepared. (A proposal has been submitted to RIRDC on modeling the regional, social and economic impacts of forestry development in FNQ, and first-stage approval has been obtained.)	Complete and publish report. Also, produce a short paper in 'Issues in Tropical Forest Landscapes' series.

Program 6

Conservation Principles and Management

Program Leader: *Dr David Westcott, CSIRO*

Researchers in Program 6 examine patterns of biodiversity, the processes that produce such patterns and their effects on rare species. Planning tools and principles that determine geographic distributions and optimum locations for rare and endangered species are being designed.

In Project 6.2.1 this year, an age to reproduction pond apple experiment was re-established and seed longevity of *Hymenachne* and *Harungana* continued. Documentation of the resource costs associated with eradication of a newly discovered siam weed infestation commenced as a guide to feasibility of future eradication programs. Project 6.2.2 has identified the feral pig diet as predominantly of plant origin and trialed a number of baits and attractants in the field. Over forty flying-fox camps are being monitored in Project 6.3.1 and researchers are developing a remote sensing technique to identify new flying-fox camps. Community wide seed shadows have been produced for the keystone fig group in Project 6.3.2 and Project 6.4 has determined the feeding preferences, ranging behaviour and thermal limitations of the green ringtail possum as baseline data for climate change effects on this species. Project 6.5 has developed a conceptual framework and models to assess the trade-off value between biodiversity benefit and social/economic benefits, using various social and economic parameters to fine tune the model.



The Diet and Trapping of Feral Pigs

Feral pigs are regarded as a significant threat to the conservation values of the WTWHA although little quantitative data is available. Earlier Rainforest CRC work quantified the potential of feral pigs to distribute weed species and this current project will establish if a conditioned avoidance of foods technique can be used to protect rare and threatened species from pig predation.

In total, 159 dietary samples (stomach, colon and faecal) have been collected, of which 58 stomach samples have been fully analysed. A wide range of plant and animal material has been observed reflecting the omnivorous diet of feral pigs. Components include fruits and seeds, roots, leaves, bark, flowers, grass, snails, mammals, earthworms, lizards, banana, cane, bird feathers, centipede, and insect larva. Diet is predominately of plant origin – 94% by weight and 100% by occurrence. Only 6% of the diet is of animal origin by weight. Soil invertebrates comprised 4% of the diet weight.

In conjunction with this research, a bait and trapping system is being developed to enhance pig capture effectiveness and reduce non-target capture while decreasing trapping effort and associated costs. A range of bait materials and attractants have been tested in extensive field trials. Attractability and palatability have been recorded for each treatment. Attractability of commonly used bait materials (banana and meat) is very low, reflecting the low encounter rate of feral pigs with control devices (baits). To date, the addition of attractants to the base bait carrier materials only marginally increases attractability.

Above: Damage caused by feral pigs (Photo: Jim Mitchell)

Below: Feral pig caught by Dr Jim Mitchell (Photo: Jim Mitchell)



With trapping considered the most effective technique for controlling feral pigs, this work has major implications for protected area management. Dietary analysis will quantify the ecological impact of feral pigs for incorporation into rare and threatened species management plans, and the potential of feral pigs to distribute weed seeds can be incorporated into weed containment procedures. Development of a bait and trapping system that enhances pig capture effectiveness and reduces non-target captures will enhance trapping as a major control technique and increase adoption of pig management strategies within the community.



The Controversial Flying-Fox

Conservation and management of spectacled flying-foxes is a controversial issue. As conflict between diametrically opposed interest groups is a common feature of conservation issues in Australia, the participatory design of the project, which incorporates an extensive stakeholder forum, will serve as a model for resolving similar conservation issues.

Through research, Project 6.3.1 aims to develop practical management solutions to resolve these issues and enhance economic outcomes for growers and environmental outcomes for flying-fox conservation. The collaborative nature of the project means that stakeholder needs will be addressed with research attempting to answer questions such as what the distribution of the economic impact of flying-foxes is, and whether landscape use and its economic cost can be predicted. These will enable development of on-farm solutions and industry strategies to enhance economic viability of growers while still allowing for flying-fox conservation.

Much progress has been made towards the development of a remote sensing technique to identify flying-fox camps and a great deal of time was spent in the field monitoring colony locations and their movement. To date forty camps have been checked with a number of new camps identified. The project is now in a better position to match available archival imagery with colony activity at that time of year.

An annual census of flying-foxes was made in December 2003, with 33 colony sites checked for bats and twelve sites counted. The use of the landscape by flying-foxes component of the project is about to commence. Three satellite transmitters were purchased and will shortly be attached to animals. From the genetics component, DNA has been successfully extracted from bat faeces while all the teeth/demography information is processed. Microsatellite isolation is nearly complete. Research to date has informed the development of a Recovery Plan for Spectacled Flying-foxes which is in final draft form.

Research into the ecology and behaviour of the animal will improve environmental outcomes and contribute greatly to our understanding of these animals and their conservation. Traditional Owners are and will continue to be involved in all aspects of the project adding a cultural benefit and ensuring that traditional cultural knowledge and management will be acknowledged and incorporated into the new SFF Recovery Plan.



Left: PhD Student Samantha Fox extracts a flying-fox from a net placed near Tully, north Queensland (Photo: Samantha Fox)

Below: Launch of a colony of flying-foxes (Photo: Jon Luly)



Project 6.2.1 – Ecology and Management of Wet Tropics Weeds

Leader: Ms Melissa Setter, NR&M

A sound knowledge base is being developed in this project on the ecology and biology of Wet Tropics weeds as relevant to the prediction and intervention of their effects on Wet Tropics rainforests and associated ecosystems.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Continue seed longevity experiments for pond apple, harungana, hymenachne, siam weed and tobacco weed.	All 03/04 replicates tested. Pond apple has 0% viability after four years. Others still have viable seed after four years, so testing will continue.	Continue seed longevity experiments for harungana, hymenachne, siam weed and tobacco weed.
Establish and monitor age to reproduction and seedling survival of pond apple field experiment.	Field experiment established, monitoring commenced.	Continue monitoring, stop experiment if reproduction occurs in this timeframe.
Continue monitoring siam weed seed bank in coastal environment study.	2003 monitoring done, large scale seedling recruitment still occurring, further monitoring ongoing.	Continue monitoring until zero recruitment recorded for three consecutive years.
Continue hymenachne shade experiment..	2003 monitoring done. No obvious effect observed as yet. Further monitoring ongoing.	Continue monitoring long term.
Establish experiment to quantify effort required to eradicate a known population of siam weed.	Base line data gathered, initial treatment applied.	Monitoring and retreatment of any survivors or seedlings. Possibly provide data to Weeds CRC.

Project 6.2.2 – Diet and Trapping Strategies of Feral Pigs in the WTWHA

Leader: Dr Jim Mitchell, NR&M

The diet of feral pigs in the WTWHA is being quantified in this project to establish their predatory impact on rare and threatened species, and potential to distribute weed species. Currently measuring the effectiveness of trapping as a feral pig control technique, and bait strategy packaged to enhance trapping effectiveness in the Wet Tropics region.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Obtaining dietary samples on a monthly basis.	An additional thirty stomach samples obtained.	Obtaining dietary samples on a monthly basis.
Analysis of dietary samples.	58 stomach samples now analysed.	Analysis of dietary samples.
Complete field testing on a range of bait carrier materials. Seven major field trials completed.	Completion of testing of bait carrier materials.	Complete field testing on novel attractants.



Project 6.3.1 – Spectacled Flying-foxes: Solutions for Management

Leader: Dr David Westcott, CSIRO

This project is developing management solutions that will enable spectacled flying-fox conservation and a prosperous fruit growing industry to co-exist in the long term.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Formation of Flying-fox Forum.	Delayed but to carry over.	Flying-fox Forum formed and operational.
Institutional Planning Workshop conducted.	Delayed but to carry over.	Institutional planning workshop conducted.
Remote sensing camp identification and habitat selection study commenced.	Much progress made. Many imagery sources evaluated. Monthly monitoring of camps underway – data is being used to inform appropriate choices of remote sensing imagery.	Remote sensing project finalised. Landscape ecology component underway – satellite transmitters attached to animals. SFF Recovery Plan completed.

Project 6.3.2 – Seed Dispersal: A Threatened Ecological Process

Leader: Dr David Westcott, CSIRO

This project focuses on the animal-mediated ecosystem process of seed dispersal. By combining scientific descriptions of seed dispersal processes within rainforests and agricultural landscapes with spatially explicit simulation modeling, it aims to provide managers with an understanding of seed dispersal and its outcomes in rainforest landscapes.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Commence modeling collaboration with Weeds CRC researchers.	A Pond apple paper has been completed. Invitation and Participation in Weeds CRC Weed Incursion Workshop, Brisbane.	Produce community level comparison of seed shadows in fragmented and continuous landscapes.
Completion of gut passage trials and final germination trials begun.	Gut passage trials are completed and germination trials are in their final stages.	
Working and parametised model of weed dispersal completed.	A simple simulation model of seed dispersal has been completed and paramaterised for figs.	
Completion of movement studies in fragmented landscapes.	This data collection is all but complete. Some data is in hand for all groups with only minor sample size increases yet to be done.	

Project 6.4 – Impacts of Climate Change on Australia’s Rainforest Marsupial Folivores

Leader: Dr Andrew Krockenberger, JCU

Based on species biology, this project develops predictive models for rainforest marsupial folivore distribution that can be used to predict impacts of climate change on animals that are seriously threatened due to their specialised habitat requirements and limited geographical range.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Preliminary laboratory data on thermal limitation of green ringtail possum.	Determination of feeding preferences and ranging behaviour. Commencement of water supplementation experiment.	Begin development of predictive model.



Research into the effects of climate change on our endangered rainforest marsupials sparked major media coverage.

Project 6.5 – Dynamic Models for Management

Leader: Dr Chris Margules, CSIRO

Explicit GIS-based modelling tools and other quantitative methods are being used in this project to develop management models that incorporate consideration of ecological processes and patterns with economic costs and benefits. A number of dynamic management models and conservation tools based on sound ecological and evolutionary principles will be produced.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Meetings with specific management groups and other stakeholders.	Three meetings held throughout the year with various user groups and stakeholders.	Complete joint analyses with user groups and continue discussions with stakeholders.
Publications on optimising surveys, patterns of surrogacy and patterns of dissimilarity.	Two publications out for peer review. One publication completed for FNQ NRM Ltd.	Two more peer-reviewed publications planned.
Database audit and compilation of data on social and economic indicator.	Data audit near completion. Database on social and economic indicators complete.	Completion of database audit and social and economic database.
Meeting outcomes on management priorities and targets.	Participation in FNQ NRM Ltd biodiversity review and target setting.	Implementation of biodiversity tools based on management priorities and targets.

Program 7

Aboriginal Collaboration and Capacity-Building In Research

Program Leader: Dr Sandra Pannell

Three new projects were supported by Program 7 this year. Indigenous cultural and natural resource management aspirations are being documented in Project 1.4, commercial possibilities for Indigenous people stemming from the domestication of native trees and other plants explored in Project 7.3 and Aboriginal environmental histories on the Tableland recorded in Project 7.1. Results from these projects will contribute to regional and national environmental planning and protection processes.

An exciting development initiated by Program 7 this year is *Country Matters*, a weekly Indigenous environmental radio program. Broadcast around the nation, *Country Matters* is produced by Velma Gara and the team at Townsville Aboriginal and Islander Media Association.

Program 7 Leader, Dr Pannell, has also been instrumental in facilitating Ngadjon-Jii environmental trusteeship over the Malanda Conservation Park, a meeting between Traditional Owners of the Wet Tropics World Heritage Area and a delegation from the Lorentz World Heritage Area in the province of Papua, Indonesia, contract employment for Indigenous people, and an Indigenous Agroforestry Strategy meeting. In addition, Dr Pannell has worked together with Djiru people to prepare a submission regarding land transfers in the Mission Beach area, and provided anthropological advice on a number of regional Native Title claims. Apart from her membership on the Rainforest Aboriginal Consultative Committee, Dr Pannell is also a member of the CRC Reef Indigenous Working Group and the Indigenous Technical Support Group, which provides input into the development of the Indigenous NRM Plan.

Project 7.1 – An Environmental History of Ngadjon-Jii Country and Community

Leader: Dr Sandra Pannell, JCU and Ms Yvonne Canendo, Ngadjon

Indigenous values, perspectives and indicators of environmental change and continuity are being identified in this project, and their overall role in contemporary environmental management regimes examined. The capacity of the Ngadjon-Jii people will be developed in social and environmental research and land management skills and in technical aspects of audio-visual media production.

This year, consultations were conducted with Ngadjon-Jii people regarding the research plan, training and field surveys and the archival and photographic data base of the Cairns Historical Society, Eacham Historical Society, and James Cook University Library were researched. Copies of relevant documents were provided to Ngadjon-Jii and field-based audio-visual training given to selected Ngadjon-Jii research participants.

Field surveys were undertaken with Ngadjon-Jii people to record the environmental values and histories of the Malanda Conservation Park, Topaz Road National Park, Top Camp in Wooroonooran National Park, former Aboriginal occupation sites around the Malanda township, Jillan, Lake Eacham, Bunjabilli, Gulkagulka, Josephine Falls in Wooroonooran National Park, various farms at Glen Allyn, Curtain Fig Tree National Park, Picnic Crossing on the Barron River, The Seven Sisters near Atherton, the Johnstone River and a number of its tributaries, the Russell River, Old Boonjie and the Topaz area.

Milestones 03/04	Achievements 03/04	Milestones 04/05
Complete first and second training workshops.	In consultation with Ngadjon-Jii people, field-based training was adopted and implemented before, during and after surveys.	Post field work training proposed.
Complete field-based research interviews.	Four field trips were undertaken with Ngadjon-Jii people.	Further field trips planned for 2004-2005.
Complete archival research.	Archival research undertaken at Cairns Historical Society, Eacham Historical Society and at James Cook University Library.	Further archival research at John Oxley library proposed for 2004-2005.
Complete draft report and other research products.	Three progress reports completed, a number of audio-visual tapes have been produced, as well as a digital photographic collection and indexed field notes.	Final AIATSIS report proposed for September 2004.
Complete final report and research products.	Material for the production of final report produced and collated.	Final report and other research products completed.





Project 7.3 – Technical Education and Training and Participatory Domestication of Native Food Plants with the Ma:Mu Community

Leader: Professor Roger Leakey, JCU and Ms Marianne Helling, TAFE

This project is providing the necessary skills and qualifications for the Ma:Mu Aboriginal community to develop superior cultivars of a number of bush tucker species for further multiplication and to successfully operate a plant nursery and orchard enterprise.

Two students have completed TAFE Certificates III / IV and enrolled for Diploma in Conservation and Land Management. One more student has been enrolled in Certificate III and three Green Reserve participants have joined the Project.

Exploration within the Ma:Mu Native Title area has commenced looking for elite trees of the fourteen priority species of indigenous fruits and nuts – specifically in the areas of Palmerston, Innisfail, Woopen Creek, ETTY Bay, Upper Daragee and Mena Creek (Japoonvale). The first half of the year was not good for fruiting and consequently only three elite trees of *Syzygium forte* ssp *forte* were located and selected to date. A major constraint to progress has been the refusal of an 'EPA Permit to Take, Use, Keep or Interfere with Cultural or Natural Resources' in Protected Areas. Instead, an 'Educational Purposes Permit' has been issued which limits collection of fruits to Non-Protected Areas. This prevents the team from fruit collection in much of the Ma:Mu Native Title area.

Alfie McCarthy with blue quandong, cherry satinash, lemon aspen and lilly pilly. (Photo Brian Cassey, The Courier Mail)

Milestones 03/04	Achievements 03/04	Milestones 04/05
Recruitment and enrolment of scholarship Conservation and Land Management students.	Completed (William Niehsner, Francis Bull).	Completion of Certificate III/IV qualification by scholarship students.
Investigation of additional educational opportunities through traineeships and labour market programs.	One additional Certificate III student enrolled. Three Ma:Mu Green Reserve participants completed twenty week program. (Jo Rassop, Leonard and Wayne Barley)	Additional Indigenous training completed.
Permissions and licences granted.	Educational Purposes permit granted for collection of plant parts and permit from DPI Forestry has been requested.	Number and species identified, collected and propagated.