Marine and Tropical Sciences Research Facility
Milestone Report

Project 1.4.3 Summary report 2006-2007

Title: Rainforest threatened species and communities and ecosystem processes

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Institution: CSIRO Sustainable Ecosystems

Summary of Milestone report

This report summarises work carried out between December 2006 and June 2007 in pursuance of the objectives for this year. Progress was good and all milestones were met. Broad outlines for development of the project into years 2-4 were also agreed upon.

Description of the results achieved for this year

Objectives [for 4 years]:

(a) Refinement of existing survey protocols for birds and vascular plants to incorporate flying foxes, signs of fire history, presence and abundance of weeds and ferals, and expand data collection on cassowaries and on ecosystem health.

(b) Completion of baseline data for the Tully-Murray-Hull catchments using revised protocol, and collection of baseline for other priority catchments.

(c) Clarification of the community composition of threatened lowland Regional Ecosystems (REs) and their role in terms of maintaining rare and threatened species, and harbouring exotic and pest species. Identification of key indicators of ecosystem health.

(d) Assessment of key threatening processes, and of effectiveness of current management practices in maintaining lowland ecosystem health.

(e) Assessment of likelihood and direction of community change of REs under climate change scenarios, or as a result of changed ecological functioning (linked to 2.5ii.3).

(f) Determine physiological mechanisms of impacts of climate change on highland rare and threatened species concentrating on arboreal marsupials and microhylid frogs (linked to 2.5ii.4)

Progress against each objective:

a. Refinement of existing survey protocols for birds and vascular plants to incorporate flying foxes, signs of fire history, presence and abundance of weeds and ferals, and expand data collection on cassowaries and on ecosystem health.

Prior CSIRO surveys in the Tully/Murray/Hull catchments consisted of surveys of all vascular plants in representative 0.1 ha plots, together with temporally replicated surveys of bird diversity within the same area. Complementary vegetation surveys have

been carried out by QEPA according to their CORVEG protocols. The vertebrate data has been supplemented by records of cassowary sign and spectacled flying-fox spats. To support the data requirements of Projects 1.2.1 and 2.6.2 we have also collected data at each location of soil type, pig sign, and the identity, abundance and life history stage of any invasive plant species. We are currently working with the Queensland Herbarium (QEPA, Townsville) on combining our existing protocols to mutual advantage.

b. Completion of baseline data for the Tully-Murray-Hull catchments using revised protocol, and collection of baseline for other priority catchments.

A workshop was held in Cairns on November 15 to great success, with 27 attendees from 12 organisations (FNQ NRM, WTMA, EPA, QPWS, RRRC, CSIRO, JCU, Griffith Uni, Birds Australia, CAFNEC, Aboriginal Rainforest Council and Dept. Main Roads). Discussion was wide ranging and, together with post-meeting discussions with staff from WTMA, QPWS and FNQ NRM, both the location and general approach to field work was established. There was broad agreement on the proposal to concentrate on rain forest and associated communities in the Tully and Murray and extend the work into the South Johnstone catchments (including the whole of the Mission Beach area), with some supplementary surveys north as far as Cairns where particular value may be obtained from specific additional surveys. Concentrating in these areas (a) gives access to the greatest amount of complementary data, (b) narrows the focus of the research questions into a smaller area, but one with high vegetation complexity and fragmentation, and (c) ensures that data is collected within an RE framework (suitable for WTMA & EPA reporting) set within a catchment framework (suitable for FNQ NRM reporting).
The proposal to work primarily on the botanical components was broadly accepted, as (a) we have good background data and experience, (b) that's where the legislative process focuses, (c) because we are interested in ecosystem health and processes, and the botanical layer provides a good base from which to do this and (d) because the plant communities provide a good surrogate for other, harder and more costly to assess groups. We also pick up data on weeds & ferals, & iconic/threatened spp. inc. cassowary and mahogany glider, fire scars and signs of human activity. Bird diversity will be studied in a subset of sites as they have synergistic effect on the dispersal of weeds & natives so have important ecosystem health impacts, both positive and negative.

Improved weather conditions after the end of the wet season permitted fieldwork activities, with 33 sites contributed during the year, five of which represent the first ever survey in that RE type. This means that we now have baseline data for 15 of the 16 REs which occupy >100 ha in the Tully/Murray/Johnstone catchments below 100 m asl (Table 1). From this list the REs of focus for the next phase of the project will be identified.

Table 1. Regional Ecosystems (REs) of rain forest broad vegetation types below 100 m asl in the Tully, Murray and South Johnstone catchments. The combined area of all fragments or blocks of each RE across the three catchments is given, together with the total number of surveys (from all sources) within each vegetation type across the whole Bioregion. All unshaded REs are either of concern or endangered for either vegetation or biodiversity management, or both;.RE types highlighted in turquoise are not of concern for either vegetation management or biodiversity management. CSIRO contributed surveys in **bold** represent the first full vascular plant survey in that RE type recorded for the Bioregion. REs according to Queensland Government Environmental Protection Agency (2005), version 5.0. Data correct to 31 May 2007; survey effort will continue through June.

Regional Ecosystem and vegetation sub-type	Area in 3 catchments (ha)	No. surveys across whole of Bioregion	CSIRO contributed data & surveys	Broad vegetation type (Rain forest)
7.12.1a	10880	38	8	Simple-complex mesophyll to notophyll vine forest.
7.11.1a	8330	81	4	Simple-complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.
7.3.10a	5684	6	6	Simple-complex mesophyll to notophyll vine forest.
7.3.17	2214	8	2	Complex mesophyll vine forest.
7.11.24c	794	0	**1**	Closed vineland of wind-disturbed vine forest.
7.8.1a	779	7	1	Complex mesophyll vine forest.
7.3.10c	672	1	3	Simple-complex mesophyll to notophyll vine forest.

7.3.4	450	8	1	Mesophyll vine forest with *Licuala ramsayi* (fan palm).
7.11.1b	417	0		Simple-complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.
7.3.3a	397	1		Mesophyll vine forest with *Archontophoenix alexandrae* (feather palm).
7.12.40b	280	10		Closed vineland of wind-disturbed vine forest. Granites and rhyolites. Mesophyll to notophyll vine forest suffering from extreme wind damage where at least half the canopy has been destroyed.
7.12.1b	276	0	**1**	Simple-complex mesophyll to notophyll vine forest.
7.2.5a	249	0	**1**	Mesophyll to notophyll vine forest of *Syzygium forte* subsp. *forte* (white apple).
7.2.1a	191	2		Mesophyll vine forest.
7.3.10b	173	0	**1**	Simple-complex mesophyll to notophyll vine forest.
7.12.39a	131	0	**1**	Complex mesophyll vine forest. Fertile, well drained granites and rhyolites of the very wet and wet lowlands, foothills and uplands. Complex mesophyll vine forest. Very wet and wet lowlands and foothills.
7.11.25a	70	2		Simple-complex mesophyll to notophyll vine forest.
7.11.24a	56	0		Closed vineland of wind-disturbed vine forest.
7.2.1i	49	2		Mesophyll vine forest.
7.8.2a	46	63		Complex notophyll to mesophyll vine forest.

7.12.2b	41	0		Notophyll or mesophyll vine forest with *Archontophoenix alexandrae* (feather palm) or *Licuala ramsayi* (fan palm),
7.3.10f	38	0		Simple-complex mesophyll to notophyll vine forest.
7.8.1b	29	1	1	Complex mesophyll vine forest.
7.8.11b	26	0		Closed vineland of wind-disturbed vine forest.
7.3.23a	23	13		Simple-complex semi-deciduous notophyll to mesophyll vine forest on lowland alluvium.
7.3.49a	23	5	2	Notophyll vine forest. Species include *Syzygium tierneyanum, Grevillea hilliana, G. baileyana, Chionanthus ramiflora, Atractocarpus fitzalanii, Cryptocarya hypospodia, Millettia pinnata, Xanthostemon chrysanthus, Dysoxylum gaudichaudianum* and *Blepharocarya involucrigera*. It includes a drier northern form with sclerophyll emergents and vine thicket spp. including the additional species *Buchanania arborescens, Elaeocarpus arnhemicus, Lophostemon suaveolens* and *Erythrophleum chlorostachys*.
7.12.40a	18	2		Closed vineland of wind-disturbed vine forest. Granites and rhyolites. Open areas in vine forests, dominated by sprawling vines, commonly *Merremia peltata* and a number of other vine species, presumed to mostly originate from cyclone damaged Type 2a forests (where the entire canopy has been destroyed.). Generally foothills of coastal ranges below 400 metres.
7.2.1e	14	1		Mesophyll vine forest.
7.11.23a	12	0		Complex mesophyll vine forest. Fertile, well drained metamorphics of very wet and wet footslopes. Complex mesophyll vine forest. Fertile, well drained metamorphics of very wet and wet footslopes, in subregions other than the Daintree-Bloomfield
7.3.10d	9	0		Simple-complex mesophyll to notophyll vine forest.

7.2.2a	8	7	Notophyll to microphyll vine forest. Species commonly include *Cupaniopsis anacardioides, Diospyros geminata, Canarium australianum, Alphitonia excelsa, Acacia crassicarpa, A. mangium, Hibiscus tiliaceus, Pleiogynium timorense, Chionanthus ramiflora, Blepharocarya involucrigera, Mimusops elengi, Polyalthia nitidissima, Pongamia pinnata, Geijera latifolia, Ficus opposita, Pouteria sericea, Terminalia muelleri, T. arenicola, Drypetes deplanchei,* and *Exocarpos latifolius.*
7.3.3b	7	0	Mesophyll vine forest with *Archontophoenix alexandrae* (feather palm).
7.11.2a	6	0	Notophyll or mesophyll vine forest with *Archontophoenix alexandrae* (feather palm) or *Licuala ramsayi* (fan palm).
7.2.1d	6	0	Mesophyll vine forest.
7.2.1g	6	0	Mesophyll vine forest.
7.11.24d	4	0	Closed vineland of wind-disturbed vine forest.
7.12.1d	4	0	Simple-complex mesophyll to notophyll vine forest.
7.12.48	4	3	Wind-sheared notophyll vine forest.
7.12.16a	3	102	Simple to complex notophyll vine forest, including small areas of *Araucaria bidwilli* (Bunya pine) Cloudy wet and moist uplands and highlands on granites and rhyolites. Simple notophyll vine forest (often with *Agathis microstachya*). Cloudy wet and moist uplands.
7.12.16b	3	0	Simple to complex notophyll vine forest, including small areas of *Araucaria bidwilli* (Bunya pine) Cloudy wet and moist uplands and highlands on granites and rhyolites. Simple notophyll vine forest (often with *Agathis microstachya*) recovering from disturbance, with *Acacia celsa* canopy or emergents. Cloudy wet and moist uplands.
7.12.2e	2	0	Notophyll or mesophyll vine forest with *Archontophoenix alexandrae* (feather palm) or *Licuala*

			ramsayi (fan palm),
7.2.1h	1	0	Mesophyll vine forest.
7.11.24b	0.78	0	Closed vineland of wind-disturbed vine forest.
7.8.11a	0.27	0	Closed vineland of wind-disturbed vine forest.
7.12.11b	0.26	3	Simple to complex notophyll vine forest and semi-evergreen notophyll vine forest.
7.12.7a	0.04	20	Simple to complex microphyll to notophyll vine forest, often with *Agathis robusta* (kauri pine) or *A. microstachya* (bull kauri).

c. Clarification of the community composition of threatened lowland Regional Ecosystems (REs) and their role in terms of maintaining rare and threatened species, and harbouring exotic and pest species. Identification of key indicators of ecosystem health

In conjunction with MTSRF project 1.2.1 we collated metadata for all apparently relevant datasets for the proposed study region, and created GIS overlays to indicate the current distribution of comprehensively surveyed sites, to cross reference against current RE classification and various topographic and edaphic layers. Communities classified as threatened under the EPBC act were identified (see Table 2) and supplementary species composition data has been collected where possible and appropriate. For some poorly-defined REs we have made additional surveys in order to document community variation within an RE class, and to capture the spatial distribution of those variations. Some highlights of surveys are outlined in Table 3.

Identification of indicators of key ecosystem health: we have collected data on species composition in seedling, sapling and canopy cohorts to look at regeneration success and trajectory, levels of weed infestation, signs of feral animal presence and impact and the size and richness of the avian community in selected sites. These data will be built into the years 2-4 objectives to specifically assess the trajectory and viability of different sizes, ages and landscape contexts of fragments from specific RE classes. Scheduled comparative field surveys with QEPA in August 2007 will allow us to refine our indicators of ecosystem health with existing QEPA approaches to monitoring and measuring biocondition.

d. Assessment of key threatening processes, and of effectiveness of current management practices in maintaining lowland ecosystem health.

Key threats and threatening processes perceived to have greatest impact on rain forest habitats within the Bioregion have been drawn from the Regional Ecosystem documentation, http://www.epa.qld.gov.au/media/nature_conservation/biodiversity/regional_ecosystem.csv), and then the relevance and impact of each of these in a coastal lowland context has been considered. The threat types and details of these are provided in Table 4.

Responses to or consideration of specific threats

1. Work to date has focussed around analysis of the distribution of rain forest REs in the target area occurring below 100 m asl. This has identified 46 separate types, of which 22 appear to be lacking any full vascular plant surveys from the Bioregion [see Table 1]. These have been ranked in order of the area covered within the study area, and those which are least threatened according to current RE assessment have been identified. We have data or have surveyed since December an additional 31 of the lowland rain forest REs, including 4 which appear to have never been surveyed before. Surveys are at present aiming to fill significant gaps in our knowledge of the lowland communities, and of documenting the key threatening processes that are apparent at each survey. [*see objective b & c*] Collection of records of species presence allow clarification of existing species distribution records, and occasionally extensions to species geographic or altitudinal ranges, records from new land form or geological types, or in different community contexts. This information will be shared with the EPA Northern Regional Office (Townsville) to

Table 2. Regional Ecosystems between 0-100 m in the Tully, Murray and South Johnstone catchments. Status correct to 9 December 2005 (Environmental Protection Agency (2005). *Regional Ecosystem Description Database (REDD)*. Version 5.0. Updated December 2005. Database maintained by Queensland Herbarium, Environmental Protection Agency, Brisbane.)

Regional Ecosystem and vegetation sub-type	Biodiversity management status	Vegetation management status
7.1.1	No concern at present	Not of concern
7.1.2a	**Of concern/endangered**	**Of concern/endangered**
7.1.2b	**Of concern/endangered**	**Of concern/endangered**
7.1.3a	**Of concern/endangered**	**Of concern/endangered**
7.1.3b	**Of concern/endangered**	**Of concern/endangered**
7.1.3c	**Of concern/endangered**	**Of concern/endangered**
7.1.4b	**Of concern/endangered**	**Of concern/endangered**
7.11.10a	**Of concern/endangered**	**Of concern/endangered**
7.11.18a	**Of concern/endangered**	**Of concern/endangered**
7.11.18b	**Of concern/endangered**	**Of concern/endangered**
7.11.18e	**Of concern/endangered**	**Of concern/endangered**
7.11.1a	**Of concern/endangered**	Not of concern
7.11.1b	**Of concern/endangered**	Not of concern
7.11.23a	**Of concern/endangered**	**Of concern/endangered**
7.11.24a	**Of concern/endangered**	**Of concern/endangered**
7.11.24b	**Of concern/endangered**	**Of concern/endangered**
7.11.24c	**Of concern/endangered**	**Of concern/endangered**
7.11.24d	**Of concern/endangered**	**Of concern/endangered**
7.11.25a	**Of concern/endangered**	**Of concern/endangered**
7.11.2a	**Of concern/endangered**	**Of concern/endangered**
7.11.34a	**Of concern/endangered**	**Of concern/endangered**
7.11.36	**Of concern/endangered**	**Of concern/endangered**
7.11.5a	No concern at present	Not of concern
7.11.5b	No concern at present	Not of concern
7.11.5e	No concern at present	Not of concern
7.12.11b	**Of concern/endangered**	Not of concern
7.12.12a	**Of concern/endangered**	**Of concern/endangered**
7.12.16a	No concern at present	Not of concern
7.12.16b	No concern at present	Not of concern
7.12.1a	No concern at present	Not of concern
7.12.1b	No concern at present	Not of concern
7.12.1d	No concern at present	Not of concern
7.12.23a	**Of concern/endangered**	**Of concern/endangered**
7.12.23b	**Of concern/endangered**	**Of concern/endangered**
7.12.23d	**Of concern/endangered**	**Of concern/endangered**
7.12.23e	**Of concern/endangered**	**Of concern/endangered**
7.12.24a	No concern at present	Not of concern
7.12.24b	No concern at present	Not of concern
7.12.25a	**Of concern/endangered**	**Of concern/endangered**
7.12.26c	No concern at present	Not of concern
7.12.26d	No concern at present	Not of concern
7.12.28a	No concern at present	Not of concern
7.12.28b	No concern at present	Not of concern
7.12.29a	No concern at present	Not of concern

7.12.2b	**Of concern/endangered**	**Of concern/endangered**
7.12.2e	**Of concern/endangered**	**Of concern/endangered**
7.12.37a	**Of concern/endangered**	**Of concern/endangered**
7.12.37i	**Of concern/endangered**	**Of concern/endangered**
7.12.39a	**Of concern/endangered**	**Of concern/endangered**
7.12.4	**Of concern/endangered**	**Of concern/endangered**
7.12.40a	**Of concern/endangered**	**Of concern/endangered**
7.12.40b	**Of concern/endangered**	**Of concern/endangered**
7.12.48	**Of concern/endangered**	**Of concern/endangered**
7.12.53a	No concern at present	Not of concern
7.12.53b	No concern at present	Not of concern
7.12.54a	**Of concern/endangered**	**Of concern/endangered**
7.12.59	**Of concern/endangered**	**Of concern/endangered**
7.12.5a	**Of concern/endangered**	**Of concern/endangered**
7.12.5b	**Of concern/endangered**	**Of concern/endangered**
7.12.5c	**Of concern/endangered**	**Of concern/endangered**
7.12.5d	**Of concern/endangered**	**Of concern/endangered**
7.12.5f	**Of concern/endangered**	**Of concern/endangered**
7.12.5g	**Of concern/endangered**	**Of concern/endangered**
7.12.60a	**Of concern/endangered**	**Of concern/endangered**
7.12.60b	**Of concern/endangered**	**Of concern/endangered**
7.12.61a	**Of concern/endangered**	Not of concern
7.12.66c	**Of concern/endangered**	**Of concern/endangered**
7.12.7a	No concern at present	Not of concern
7.12.9	**Of concern/endangered**	**Of concern/endangered**
7.2.11a	**Of concern/endangered**	**Of concern/endangered**
7.2.11b	**Of concern/endangered**	**Of concern/endangered**
7.2.11c	**Of concern/endangered**	**Of concern/endangered**
7.2.11d	**Of concern/endangered**	**Of concern/endangered**
7.2.11e	**Of concern/endangered**	**Of concern/endangered**
7.2.11f	**Of concern/endangered**	**Of concern/endangered**
7.2.11g	**Of concern/endangered**	**Of concern/endangered**
7.2.1a	**Of concern/endangered**	**Of concern/endangered**
7.2.1d	**Of concern/endangered**	**Of concern/endangered**
7.2.1e	**Of concern/endangered**	**Of concern/endangered**
7.2.1g	**Of concern/endangered**	**Of concern/endangered**
7.2.1h	**Of concern/endangered**	**Of concern/endangered**
7.2.1i	**Of concern/endangered**	**Of concern/endangered**
7.2.2a	**Of concern/endangered**	**Of concern/endangered**
7.2.3a	**Of concern/endangered**	**Of concern/endangered**
7.2.3b	**Of concern/endangered**	**Of concern/endangered**
7.2.3c	**Of concern/endangered**	**Of concern/endangered**
7.2.3d	**Of concern/endangered**	**Of concern/endangered**
7.2.3e	**Of concern/endangered**	**Of concern/endangered**
7.2.3f	**Of concern/endangered**	**Of concern/endangered**
7.2.3i	**Of concern/endangered**	**Of concern/endangered**
7.2.4a	**Of concern/endangered**	**Of concern/endangered**
7.2.4b	**Of concern/endangered**	**Of concern/endangered**
7.2.4c	**Of concern/endangered**	**Of concern/endangered**
7.2.4d	**Of concern/endangered**	**Of concern/endangered**
7.2.4e	**Of concern/endangered**	**Of concern/endangered**
7.2.4f	**Of concern/endangered**	**Of concern/endangered**
7.2.4g	**Of concern/endangered**	**Of concern/endangered**
7.2.4i	**Of concern/endangered**	**Of concern/endangered**

7.2.4k	**Of concern/endangered**	**Of concern/endangered**
7.2.5a	**Of concern/endangered**	**Of concern/endangered**
7.2.7a	**Of concern/endangered**	**Of concern/endangered**
7.2.8	**Of concern/endangered**	**Of concern/endangered**
7.2.9a	**Of concern/endangered**	**Of concern/endangered**
7.2.9b	**Of concern/endangered**	**Of concern/endangered**
7.2.9c	**Of concern/endangered**	**Of concern/endangered**
7.2.9d	**Of concern/endangered**	**Of concern/endangered**
7.3.10a	**Of concern/endangered**	**Of concern/endangered**
7.3.10b	**Of concern/endangered**	**Of concern/endangered**
7.3.10c	**Of concern/endangered**	**Of concern/endangered**
7.3.10d	**Of concern/endangered**	**Of concern/endangered**
7.3.10f	**Of concern/endangered**	**Of concern/endangered**
7.3.12a	**Of concern/endangered**	**Of concern/endangered**
7.3.12b	**Of concern/endangered**	**Of concern/endangered**
7.3.12c	**Of concern/endangered**	**Of concern/endangered**
7.3.16a	**Of concern/endangered**	Not of concern
7.3.16c	**Of concern/endangered**	Not of concern
7.3.17	**Of concern/endangered**	**Of concern/endangered**
7.3.19a	**Of concern/endangered**	**Of concern/endangered**
7.3.19b	**Of concern/endangered**	**Of concern/endangered**
7.3.19d	**Of concern/endangered**	**Of concern/endangered**
7.3.19e	**Of concern/endangered**	**Of concern/endangered**
7.3.1a	**Of concern/endangered**	**Of concern/endangered**
7.3.20a	**Of concern/endangered**	**Of concern/endangered**
7.3.20b	**Of concern/endangered**	**Of concern/endangered**
7.3.20c	**Of concern/endangered**	**Of concern/endangered**
7.3.20d	**Of concern/endangered**	**Of concern/endangered**
7.3.20e	**Of concern/endangered**	**Of concern/endangered**
7.3.20f	**Of concern/endangered**	**Of concern/endangered**
7.3.20k	**Of concern/endangered**	**Of concern/endangered**
7.3.21a	**Of concern/endangered**	**Of concern/endangered**
7.3.23a	**Of concern/endangered**	**Of concern/endangered**
7.3.25a	**Of concern/endangered**	**Of concern/endangered**
7.3.25b	**Of concern/endangered**	**Of concern/endangered**
7.3.25c	**Of concern/endangered**	**Of concern/endangered**
7.3.28a	**Of concern/endangered**	**Of concern/endangered**
7.3.28b	**Of concern/endangered**	**Of concern/endangered**
7.3.28d	**Of concern/endangered**	**Of concern/endangered**
7.3.29a	**Of concern/endangered**	**Of concern/endangered**
7.3.32a	**Of concern/endangered**	**Of concern/endangered**
7.3.34	**Of concern/endangered**	**Of concern/endangered**
7.3.35a	**Of concern/endangered**	**Of concern/endangered**
7.3.3a	**Of concern/endangered**	**Of concern/endangered**
7.3.3b	**Of concern/endangered**	**Of concern/endangered**
7.3.4	**Of concern/endangered**	**Of concern/endangered**
7.3.40	**Of concern/endangered**	**Of concern/endangered**
7.3.44	**Of concern/endangered**	**Of concern/endangered**
7.3.45b	**Of concern/endangered**	Not of concern
7.3.45c	**Of concern/endangered**	Not of concern
7.3.46	**Of concern/endangered**	**Of concern/endangered**
7.3.49a	**Of concern/endangered**	**Of concern/endangered**
7.3.5a	**Of concern/endangered**	Not of concern
7.3.5b	**Of concern/endangered**	Not of concern

7.3.5d	**Of concern/endangered**	Not of concern
7.3.6a	**Of concern/endangered**	**Of concern/endangered**
7.3.7a	**Of concern/endangered**	**Of concern/endangered**
7.3.7b	**Of concern/endangered**	**Of concern/endangered**
7.3.7c	**Of concern/endangered**	**Of concern/endangered**
7.3.8a	**Of concern/endangered**	**Of concern/endangered**
7.3.8b	**Of concern/endangered**	Not of concern
7.3.8c	**Of concern/endangered**	Not of concern
7.3.8d	**Of concern/endangered**	Not of concern
7.8.11a	**Of concern/endangered**	**Of concern/endangered**
7.8.11b	**Of concern/endangered**	**Of concern/endangered**
7.8.1a	**Of concern/endangered**	Not of concern
7.8.1b	**Of concern/endangered**	Not of concern
7.8.2a	**Of concern/endangered**	Not of concern
7.8.7b	**Of concern/endangered**	**Of concern/endangered**

Table 2. Details of selected Threatened Species and Communities gap-filling surveys (December 2006 - May 2007)

1. 7.11.24c. This RE is considered "Of Concern" and hasn't had a full survey done previously. It was surveyed west of South Mission Beach. One R&T species, *Ilex* sp. (Gadgarra) was collected at this site.
2. 7.12.1b. This RE hasn't had a full survey done previously. It was surveyed west of South Mission Beach near the North Hull River.
3. 7.12.39a. This RE is considered "Of Concern" and hasn't had a full survey done previously. In addition it is considered to be in a mesophyll rainforest refugia. It was surveyed in the Jarra Creek area. Several R&T species, including *Pseuduvaria villosa* and *Haplostichanthus* sp. (Topaz) were recorded at this site. An unusual specimen of possibly *Pararistolochia praevenosa* was collected and sent to the Queensland Herbarium for verification. This is a new population for this species, as it is only known from the Gillies Crater in the Wet Tropics.
4. 7.3.4. This RE is considered "Of Concern" and occurs in the same refugial area as 7.12.39a. This RE has been surveyed previously, but not in this location or topographic position. The Wet Tropic endemic fern *Diplazium dameriae* was collected at this site along with *Lophatherum gracile*, which is a rather rare grass although it is not listed as such. This is a new location for *Lophatherum*. The small terrestrial fern *Pronephrium triphyllum* was recorded at a new southern limit here. It normally grows alongside creeks, but not so here. Cassowary seen at this site.
5. 7.3.17. This RE is considered "Endangered" and has been previously surveyed. At this location however, on the Tully River, it is an example of a taller and more diverse forest. *Canarium acutifolium* and *Gouania australiana* are examples of R&T's found at this location. The *Canarium* is at a new southern limit and was appropriately vouchered. In addition *Ailanthus integrifolia* was at a new southern limit also, and was vouchered accordingly.
6. 7.3.17. This RE is considered "Endangered" and has been previously surveyed, but not in the considered refugial area of Jarra Creek. This community is very different to the previous 7.3.17 along the Tully River. R&T's in this community included *Pseuduvaria villosa, Costus potierae* and *Huperzia phlegmarioides.* All 3 were vouchered.
7. 7.3.20a. This RE is considered "Of Concern" and occurs in the same area as 7.12.39a, although it has been previously surveyed but not in this refugial area. *Camellia sinensis* (Tea) was vouchered from this survey and after discussions with the Principal Botanist at the Queensland Herbarium, Tea is now regarded as a new naturalised species for the Wet Tropics.
8. 7.2.3d. This RE is considered "Of Concern" and has only had one previous survey. The survey was done near Hull Heads.
9. 7.3.7c. This RE is considered "Endangered" and has not been previously surveyed. The survey was carried out east of Euramo. The R&T *Macaranga polyadenia* was vouchered at this new southern limit.
10. 7.3.8a. This RE is considered "Not of Concern" and has been 'over surveyed' however this survey was undertaken in a significantly different community than is the norm for 7.3.8a as at this site, west of Mission Beach, the community is dominated by *Melaleuca quinquenervia* and not the usual *Melaleuca viridiflora.* This discrepancy will be relayed to EPA and WTMA. The R&T *Hedyotis novoguinensis* is a common herb at this site and was vouchered.
11. 7.11.36. This RE is considered "Of Concern" and hasn't had a full survey done previously. The unusual rock type makes this RE unique in itself. The survey provided few highlights, although it was the paucity of species and what wasn't there (viz. *Melaleuca* spp.) which makes this RE interesting. A ground orchid was collected for growing on as it wasn't flowering at the time of the survey.
12. 7.3.10b. This RE is considered "Of Concern" and hasn't had a full survey done previously. The survey provided some amazing species, particularly *Cryptocarya putida* and *Cryptocarya saccharata*, which haven't been collected

on the coastal plain previously. Some pig damage evident. Cassowary footprint seen near this site.

13. 7.3.7b. This RE is considered “Endangered” and has only been surveyed once before. This site has been burnt and logged previously. It is likely that the *Euc. pellita* canopy trees recruited as a single cohort after a large fire in the past as they were of similar diameter. The R&T *Macaranga polyadenia* was a very common small tree along the permanent sluggish creek, whereas *Hedyotis novoguinensis* was considered rare. Pig damage evident and recent.

Table 3. List of identified threats and threatening processes

Threat type	**Specific threat**
Data quality	1. lack of knowledge about species distributions and community composition, or limited confidence in spatial referencing or community typing on older collections
Short-term threats mediated by humans	2. clearing or fragmentation of native vegetation 3. invasive plants, including those which physically displace native species, but also those which may disrupt other ecological processes 4. feral animals, especially rooting damage by pigs but also grazing and trampling by feral cattle and horses 5. inappropriate fire regimes, in the Wet Tropics context this typically means burning too infrequently or with fires of insufficient intensity 6. excessive grazing pressure from pastoral activity 7. infrastructure development or landuse change, identified (a) through existing zoning and (b) through identification of natural communities in areas likely to support expansion in the future
Longer-term climate change impacts	8. climate change affecting the distribution of the environmental envelope within which particular species can exist 9. climate change forcing inundation or flooding either through sea level rise, storm surges or increased flooding of low-lying areas due to more intense rainfall events 10. increased intensity and duration of cyclones as a result of sea temperature rises

support refinement of the existing rain forest RE classifications, and will be matched by their woodland surveys scheduled to begin in 2007-08. Exchange of survey proformae and a joint field trip scheduled for May 2007 to consider both a rain forest and a woodland site will ensure parity in survey methodology, and help inform the development of a standard rain forest condition monitoring proforma by the EPA to compliment the widely used version for woodlands (EPA: Neldner *et al*.) and the prototype model for assessing revegetation sites (Kanowski & Catterall).

2. While future clearing or fragmentation of native vegetation is restricted by the *Vegetation Management Act (1999)*, the legacy of past clearing and the longer term impacts of fragmentation and habitat isolation may still be to fully realise their effects on remnant patches of vegetation and the animal communities contained within them.

3. Invasive plants are recorded in vascular plant surveys (see (a) above), and our point data are supplemented by parallel work with the Weeds CRC and the Queensland DNRM&W. Siam weed was recorded at a vascular plant survey site in the Tully catchment in March. Weed data are collated, together with contextual and location data, and passed on to relevant authorities, including the EPA, DNRM&W eradication teams, and private landholders, in addition to collated data reporting to FNQ NRM and to MTSRF project 2.6.2 Invasive Species. Data is also being retained pending inclusion in a MTSRF project 1.2.1 Status & Trends proposed weeds & ferals mapping project, to be included in the ARP2 submissions. Massive recruitment of native species such as *Merremia* are also recorded where their abundance threatens ecological processes and the recruitment of other native species.

4. The incidence of encounters with, or signs of, feral animals, is recorded during the surveys outlined in section (a) above. To date, only signs of pigs have been recorded. These data are forwarded to MTSRF project 2.6.2 Invasive Species, and will be forwarded to landholders and statutory authorities where appropriate.

5. Fire scarring or other signs of fire are recorded during surveys. We have also deliberately selected REs which appear to be in various stages of rain forest invasion due to lack of fire (two sclerophyll sites to date), and sites which have recently (<12 months) received management burns (two sites to date, one sclerophyll site and one *Melaleuca* site).

6. Excessive grazing does not appear to be a significant threat to ecosystems in the coastal lowlands.

7. We have obtained land zone classifications for the three catchment study areas as GIS overlays, and will analyse their potential impact on remnant native vegetation should planning permission be given to develop those areas. These analyses will take particular account (a) of the potential impact on the total resource of each RE in the three catchments, (b) on the total resource of each RE in the Bioregion, (c) on the effects of clearance on further isolation of any existing native vegetation in the area.

8. The impacts of climate change [*see objective e*] are difficult to model at such a local level, but the regional climate averages show an increase in temperature and a decrease in annual rainfall over the last 36 years (Australian Bureau of Meteorology 2007). Hilbert et al. (2001) suggest that under a 1°C increase in temperature and a -10% decrease in rainfall that annual rainfall would fall, caused by decreases in both summer and winter rainfall. This would lead to significant change in community composition, with predicted shifts in coastal vegetation complexes and lowland palm forests particularly (Hilbert, Graham & Hopkins, in press). Of special note in the Tully-Murray is the generation of

climatic envelopes that are currently unseen within the Bioregion, so of unknown consequence for the persistence of species and significantly, for the composition of communities. In conjunction with MTSRF project 2.5ii.3 these scenarios will be reapplied to the study catchments when the vegetation community survey and analysis is completed in an attempt to highlight which if any communities appear to be most likely to change under predicted climate scenarios, and what the direction of change might be.

9. Increased frequency or magnitude of flooding and inundation may occur (i) from sea level rise, (ii) from increased intensity of cyclones causing storm surges, (iii) or increased intensity of rainfall events, typically associated with cyclonic low pressure systems, causing increased river discharge associated with the potential for out of bank flow. The Intergovernmental Panel on Climate Change (2001) sea level rise predictions are conservatively estimated as c. 1 mm/yr, though Church & White (2006) suggest nearly double this rate. Collapse of polar ice may lead to increases of up to 7 m in the longer tem (e.g. Gregory & Huybrechts 2006). Models of cyclone and hurricane intensity suggest that whilst cyclone frequency is not likely to change, cyclone intensity is likely to increase (Knutson & Tuleya 2004, Webster et al. 2005). Both of theses could cause salt water incursions into what are currently fresh water systems, with resulting changes in community composition. Data will be sourced from Geoscience Australia and local Councils, and where possible will be used to assess the likely extent of such incursions, the effects on existing REs, and the impacts of such changes on the extent and isolation of remaining natural vegetation.

10. Predictive climate models suggest that cyclone intensity and their duration is likely to increase as sea temperatures rise, due to the increased energy available to fuel cyclone development (Knutson & Tuleya 2004, Webster et al. 2005). Category 5 cyclones were effectively absent from the Wet Tropics coast during the twentieth century (one in 1899, and the 1918 cyclone was probably category 5) but the impact of category 5 cyclones was demonstrated by cyclone Larry (2006) and they appear to have been a feature of the area in previous centuries (Nott & Hayne 2001). The impact of cyclone Larry and its effects in terms of forest processes is being researched by this team and others through allied projects under the CSE-JCU TropLands Joint Venture partnership, and through collaborative work with QDNRM&W and the Weeds CRC. Findings from these studies will be incorporated into this study where appropriate.

Rare species are currently being recorded when encountered, or where sign of their presence is seen in the case of vertebrates. Discussions are in progress with the Australian Government NRM Facilitator for Biodiversity (Bushcare) in order to discuss means of including rare species which currently do not have such a legislative status (based on the Back on Track). [*see objective c*]

e. Assessment of likelihood and direction of community change of REs under climate change scenarios, or as a result of changed ecological functioning (linked to 2.5ii.3)

See threat types 8-10 in Table 3 (above). As field data are compiled it will be possible to assess the trajectory and likely impact of climate change on broad community types in conjunction with MTSRF project 2.5ii.3.

f. Determine physiological mechanisms of impacts of climate change on highland rare and threatened species concentrating on arboreal marsupials and microhylid frogs (linked to 2.5ii.4). JCU project component led by Dr Andrew Krockenberger.

1) Location of study sites selected for microhylid frogs

Study sites for determination of physiological tolerances/limits in microhylid frogs have been selected in collaboration with Project 2.5.ii.4 to provide comparisons among six species within the genus *Cophixalus*;

i) three with extremely upland restricted distributions- *C. monticola*, the mountain-top nursery frog (Carbine upland transect), *C. hosmeri*, the pipping nursery frog (Carbine upland transect) and *C. neglectus*, the tangerine nursery frog (Bellenden Ker transect),

ii) and three with more widespread or lowland distributions- *C. ornatus*, the common nursery frog (Bellenden Ker and Carbine Upland transects), *C. bombiens*, the Windsor nursery frog (Carbine Upland transect) and *C. infacetus*, the buzzing nursery frog (Bellenden Ker transect).

Climatic data is being collected from sites along these altitudinal transects in collaboration with Project 2.5ii.4. Climatic data across the entire transect will be complemented with micro-climatic data from microhylid refuges sites across the altitudinal range of the restricted upland species and into the widespread or lowland species altitudinal ranges. These will provide a microclimatic null-model of the habitats in which the study species are found, providing a reference for the physiological tolerances measured in this project.

It should also be noted that 5 of these 6 microhylid frog species fall into the highest extinction risk category according to the draft report on Extinction risk in Wet Tropics Vertebrates (Project 2.5.ii.4), making them priority species for understanding the possible role of physiological tolerances and limits in their responses to a changing climate.

2) Study sites for determination of physiological tolerances/limits in arboreal marsupials

Study sites for determination of physiological tolerances/limits in arboreal marsupials have been selected in collaboration with Project 2.5ii.4 along an altitudinal transect of the Atherton Uplands. These sites have been selected to provide a transect across the lower altitudinal limit of two species of marsupial folivore with strongly restricted upland distributions, the Herbert river ringtail possum, *Pseudochirulus herbertensis* and lemuroid ringtail possum, *Hemibelideus lemuroides*, as well as overlap with the distribution of the green ringtail possum, *Pseudochirops archeri*. These species are among those whose climatic habitat is most threatened by the impacts of changing climates. The sites selected will facilitate comparison of the thermal ecology of *P. herbertensis* and *H. lemuroides* with that of *P. archeri* determined in Rainforest CRC Project 6.4. Climatic data from the site collected in collaboration with Project 2.5ii.4 will be complemented with micro-climatic data from the canopy and daytime refuges (dens) at these sites to build a microclimatic model across the lower altitudinal edge of their range and determine the buffering effect of den use on thermal extremes experienced by the possums.

Fieldwork has continued at the study sites for the arboreal marsupials (*P. herbertensis and H. lemuroides*). Initially this has focussed on collecting micro-climatic data from the canopy and daytime refuges (dens) at these sites to build a microclimatic model across the lower altitudinal edge of their range and determine the buffering effect of den use on thermal extremes experienced by the possums. To that end we have successfully trialled a technique for determining den sites used by possums and located our first set of 8 dens used by Lemuroid ringtail possums at the high altitude site. This fieldwork will continue in June and July, including the placement of loggers to record den and canopy micro-climates once staff involved have completed their certification in tree climbing according to the industry standards required by the horticulture industry. This training is

scheduled for the second week in June 2007 allowing placement of the loggers to commence shortly thereafter.

Planning and preparation for the laboratory measurements of physiological responses to temperature in individual Herbert river and Lemuroid ringtail possums continues. As part of that preparation we have recruited a MappSc student to collaborate with the project in those measurements.

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