Upper Mitchell Catchment Rehabilitation Plan

Technical Report on Rehabilitation Needs

A report prepared by the NQ Afforestation Association Inc. to facilitate coordinated catchment rehabilitation in the Upper Mitchell Catchment

NQ
AFFORESTATION

The North Queensland Afforestation Association Inc. is a regional Local Government body made up of 10 member councils - Cook Shire, Douglas Shire, Cairns City, Mareeba Shire, Atherton Shire, Herberton Shire, Eacham Shire, Johnstone Shire, Cardwell Shire and Hinchinbrook Shire. The North Queensland Afforestation Association Inc. is committed to fostering sustainable resource management in the wet tropics region through initiatives such as the Wet Tropics Tree Planting Scheme and the Community Rainforest Reforestation Program.

This report is one of a series produced by the North Queensland Afforestation Association Inc. to identify rehabilitation priorities across the wet tropics and provide input to Local Authority planning schemes.

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Wet Tropics Management Authority
Department of Natural Resources
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Mitchell River Watershed Management Group
Wet Tropics Tree Planting Scheme

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Executive Summary

The North Queensland Afforestation Association Inc.(NQAA) Revegetation Planning Project aims to identify specific areas where protection of the natural vegetation and catchment rehabilitation works would be beneficial to catchment management particularly in existing planning frameworks for the river and stream catchments of Queenslands Wet Tropics Region, including the Upper Mitchell River Catchment. The planning project prioritises these and suggests a community strategy for implementing projects based on these priorities. Revegetation, pest control, grazing management and soft engineering works on rivers and lagoons are activities which can assist in improving catchment health through repair and enhanced management of land and water resources, ensuring multiple benefits to ecosystem viability, biodiversity, water quality, wildlife corridors, landscape amenity and recreation capacity.

The key areas identified under this assessment of rehabilitation needs for the Upper Mitchell Catchment unit are:

- the re-establishment of continuous riparian corridors, particularly along Bushy Creek, Devil Devil Creek and associated tributaries;
- retention and establishment of vegetation 'buffers' to reduce groundwater recharge and salinisation, especially in the cane expansion areas;
- the stabilisation of eroding riverbanks which contribute to river channel instability, sedimentation and loss of productive land resources, particularly in the Julatten area;
- the eradication of infestations of Rubber Vine, especially in the McLeod and Mary Rivers and *Thunbergia*, and *Hymenachne*;
- the establishment of strategically placed vegetation corridors to assist wildlife movements, particularly between the Mt Lewis and Mt Danbulan areas (these will usually coincide with riparian corridors) and along the coast from north to south; and
- habitat enhancement in remnant areas of natural vegetation through appropriate management of edge areas bordering agricultural and urban zones, pest eradication or introduction of appropriate fire management, particularly in the Julatten, Mount Molloy, McLeod and Mary River areas.

Additional actions required to ensure that rehabilitation works are effective in achieving a healthy, sustainably managed catchment include:

- development of a coordinated community strategy to implement and maintain priority projects (identified in this report);
- establish the extent of vegetation mapping works required on a scale relevant for vegetation management and implement required vegetation assessment and mapping projects;
- development of Vegetation Management Guidelines for local government;
- incorporation of this Catchment Rehabilitation Plan and Vegetation Management Guidelines into a "green layer" in the Mareeba Shire statutory planning process;
- on-going monitoring of the state of the natural resources in the catchment and disturbances with a negative impact on these resources (eg land clearing) and timely responses to mitigate against these disturbances; and
- periodic review and updating of this report to incorporate new data and update the catchment rehabilitation priorities as works are progressively completed.

Introduction

This report is prepared as part of the North Queensland Afforestation Association Inc. and Natural Heritage Trust funded Catchment Rehabilitation Planning Project. The outcome of this project is a series of catchment-based rehabilitation plans covering the wet tropics region. These plans are components of a bioregional planning exercise at a greater scale (and resolution) than the FNQ 2010 Planning Process and are intended to provide guidance and facilitate coordination of rehabilitation efforts. This will feed directly into local government planning processes. The initiative for the project stems from the commitment of the 10 member Councils to include a "green layer" (Greening Australia 1995) in their statutory planning processes.

Integrated catchment management (ICM) has been recognised by the Queensland Government as " the key to ecologically sustainable development" (DPI 1993) as it provides an avenue for integrating the management of land, water, vegetation and other biological resources (DPI 1994). River catchments provide clearly definable physical units which establish natural barriers for many physical and ecological processes (DPI 1993) and therefore provide an ideal unit for resource management planning.

The North Queensland Afforestation Association Inc. has recognised these principles, in addition to the valuable linkage with the local ICM groups established throughout the wet tropics, in initiating the development of a series of Catchment Rehabilitation Plans. Rehabilitation works which could be undertaken within the catchment's landscape are identified on a priority basis. The Catchment Rehabilitation Plans are also seen as part of a direct link to the Catchment Management Strategies prepared under the Department of Natural Resources' ICM program and Local Government Greening Plans (Greening Australia 1995).

The Catchment Rehabilitation Plans address the repair of degraded or threatened land, and water and biological resources which are detrimental to catchment health. A healthy catchment is one in which the ecological functions of the system are operating adequately to maintain the landscape and the communities which it supports. Rehabilitation can help restore the functioning of natural and agricultural areas which have been degraded and contribute to maintaining important natural values such as biological diversity and water quality, as well as enhancing community quality of life (DoE 1996).

A two-pronged approach has been selected for the production of these Catchment Rehabilitation Plans: a technical report and an implementation strategy (see Figure 1).

This report contains information on the identification of sites needing rehabilitation works and the priority ranking of these needs according to assessment criteria developed by the North Queensland Afforestation Association Inc. which are based on the FNQ 2010 Regional Environment Strategy (DoE, 1997).

The background information comprises a summary collation and assessment of resources within the planning area and general characteristics of the study area, parent materials, terrain and soils, water resources, vegetation (including weeds), fauna (including pests), cultural heritage and landuse. The local issues of concern affecting catchment management and the implementation of rehabilitation works are considered. Additional background information has been collated and presented in a separate Resource Volume. Criteria for assessing rehabilitation priorities are set out in Appendix 1 and species lists for revegetation works are contained in Appendix 2.

The identification of sites requiring rehabilitation has been carried out in association with technical advisers from the Wet Tropics Tree Planting Scheme (WTTPS), Catchment Management and Landcare Groups, officers of; the Department of Natural Resources (DNR), Department of Environment (DoE), Wet Tropics Management Authority (WTMA), Department of

Primary Industries (DPI), and many individuals. The areas identified are sites which present problems for the maintenance of catchment "health" and ecosystem viability and could benefit from some form of rehabilitation works. Rehabilitation activities require the full cooperation of landholders as the long-term custodians of the natural resources.

The assessment of priorities for implementing rehabilitation works has been undertaken using criteria developed by the North Queensland Afforestation Association Inc. using the DoE's rehabilitation criteria from the Regional Environment Strategy (DoE 1996). These priorities are based on catchment health and community value.
Catchment Rehabilitation involves not only planting expressly for environmental repair purposes but also plantations of trees for timber and other production purposes. Farm forestry can have multiple benefits including stabilisation of actively eroding slopes, increases in soil filtration capacity, advantages for
groundwater recharge, provision of wildlife habitat as well as obvious economic benefits.
Two large scale maps accompany this technical report. These are;

Map A (Figure) Catchment Rehabilitation Needs, and
Map B (Figure) Sites/Areas of Conservation Significance

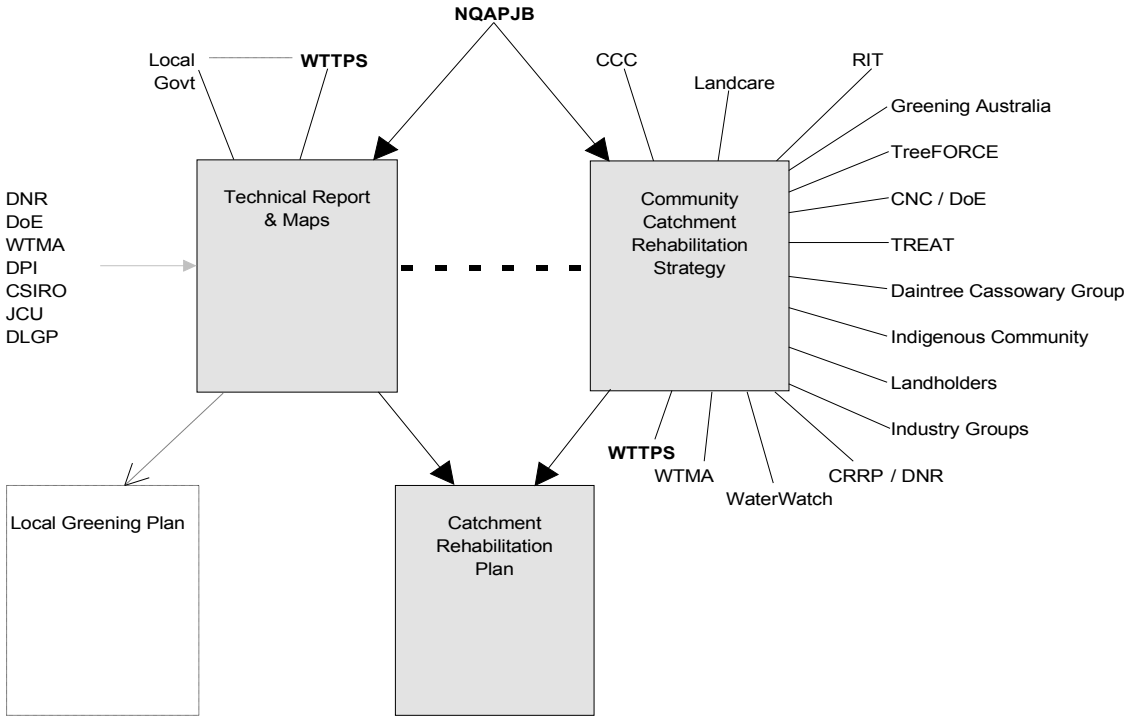

Figure 1: Catchment Rehabilitation Planning Process

2.0 The Study Area

The Mitchell River Catchment is Queensland's largest watershed in terms of average annual run-off with a mean discharge of approximately 120,000,000 megalitres. It encompasses 72,000 km^2 spanning from the Great Divide in the east across to the Gulf of Carpentaria at the base of Cape York Peninsula (MRWMG 1996). The Mitchell River's waters originate in the highlands of the Mount Carbine, Mount Windsor and Hann Tablelands at elevations greater than 1,000m.

For the purpose of this Catchment Rehabilitation Plan the study area covers the eastern uplands of the Mitchell River Catchment including the upper sections of the two major rivers, the Mitchell and Walsh. Major sub-catchments include Rifle Creek and the McLeod River, which originate in the Wet Tropics World Heritage Area (WTWHA). The boundary follows the catchment boundary in the east and in the northwestern corner is bounded by the junction of the McLeod and Mitchell Rivers. The southern boundary is formed by the Upper Walsh River sub-catchment (below Irvinebank – see Map 1).

The area is very diverse and contains elements of the wet tropics (eg. Mt Lewis) and the monsoonal dry tropics (eg Dimbulah). The annual average rainfall across the upper catchment varies from 800 to 2,000mm of which most falls between the months of November and April (MRWMG, 1996). This gives rise to drastically diverse vegetation types and fauna communities.

The northern section of the upper catchment represents a boundary zone between two bioregions, the Wet Tropics and the Einasleigh Uplands and appears to be a dynamic area of frequent and major ecological change over time (MRMWG, 1999). This results in an increased level of species diversity (Werren 1995). For this reason the northern environs of the study area between the McLeod River and Biboohra (show on locality Map 1) will be the 'focus' area of this catchment rehabilitation plan (see Map 2) and the broader area will be treated more generally and in less site detail.

The study area is situated wholly within the Mareeba Shire and has two major populated areas both centred around agriculture where there are reliable, year-round water supplies. These areas are Julatten in the hinterlands behind Mossman and the Mareeba Dimbulah Irrigation Area (MDIA) . The predominant land use is agriculture with other uses in the study area include grazing, mining and recreational fishing. Previous research (MRWMG 1996) into catchment health for the locality has recognised that intensive agriculture impacts on the surrounding environment through land clearing, erosion, changes to catchment hydrology from water extraction and the addition of irrigation water which may contain farm chemicals and fertilisers.

2.2 Other Planning Considerations

There are several management plans or similar devices that cover all or some parts of the Upper Mitchell study area. These include the;

- *FNQ 2010 Draft Integrated Regional Strategies for Far North Queensland* (1998)
- *FNQ 2010 Draft Strategic Directions and Regional Priorities for Far North Queensland* (1998) (incorporating the *FNQ 2010 Steering Committee Report on the Environment* (DoE 1997)
- FNQ *2010 Steering Committee Report on Water Management* (QDNR 1997)
- *Wet Tropics Draft Plan* (WTMA 1995)
- *Draft Wet Tropics Regional Strategy for Natural Resource Management* 1997
- *Mareeba Shire Pest Management Plan (1997)*
- *Mareeba Shire Corporate Plan/ Julatten Town Development Control Plan*

In addition there are several State Acts and Local Government Regulations that provide a statutory framework for rehabilitation works. These include;

- Water Resources (Amendment) Act (1993) - requires approval for works undertaken adjacent to or in a watercourse,
- Environment Protection Act (1994) - specifies that penalties apply to any inappropriate management of works that may cause damage to the environment,
- Integrated Planning Act (1998) - requires approval for any works that trigger an Environmental Impact Statement,
- Native Title Act (1993) - specifies consideration be given to works to be undertaken on Unallocated State Land, and Council Local Laws that should be checked prior to commencement of works.

3.0 Catchment Rehabilitation Needs and Priorities

The issues affecting catchment health in the Upper Mitchell Catchment and the rationale for rehabilitation works are considered in detail in the following sections of this report. The identification of sites in need of rehabilitation, the type of work that needs to be done and how important they are to the functioning of the catchment are outlined in this chapter. These sites will be linked to the important natural and social values, which have been used to assess their priorities and make up the set of management and rehabilitation guidelines in the appendices.

3.1 Determining Catchment Rehabilitation Needs

Rehabilitation needs were determined through collating existing information on the natural resources of the study area and consulting with various agency experts to identify the priority issues and problems. Extensive field inspections were also undertaken with input from various landowners to locate and assess problem sites. Sites/areas were ranked with criteria developed for the Draft FNQ 2010 Regional Environment Strategy (DoE 1997).

This report concentrates on rehabilitation works that can be implemented using revegetation works and land management measures. The problems that can be addressed through these activities include:

- stabilisation of riverbanks;
- stabilisation of soil erosion;
- establishment of wildlife corridors, particularly utilising riparian corridors;
- reduction in sedimentation, nutrient input and overland waterflows in watercourses;
- reduction of groundwater recharge and potential salinity problems
- eradication of weed infestations and management to prevent re-invasion (with the added advantage of improved drainage where weeds are choking water courses) through coordinated weed management programs;
- coordinated pest animal control programs;
- edge management around significant sites of conservation, cultural, scenic or other values adjacent to landuses with the potential to result in negative impacts; and
- enhancement of presentation areas for scenic drives and other community uses.

3.2 Setting Priorities for Catchment Rehabilitation Works

This evaluation process is important for ensuring that:

- commonwealth funds are used on projects with the high possible benefit to the community;
- projects are undertaken in an appropriate sequence, ie., upstream to downstream in the case of weed control and river stabilisation projects; and
- effectiveness and coordination of inputs from government agencies, community groups and landholders.

This evaluation procedure is designed to meet requirements set out under the Commonwealth funding scheme (Natural Heritage Trust) and as a basis for developing long term work schedules for WTTPS and related revegetation programs.

The criteria used for assessment are based on the FNQ 2010 rehabilitation criteria as recommended by Bell (1996). These natural area attributes have been classified into five categories: biological diversity, water and land conservation, visual/cultural landscape, recreation and urban amenity (DoE 1996). In regard to catchment health, the first two areas are of most significance.

The criteria for water and land conservation and ecosystem viability (biodiversity) have been adopted by the NQAA in this assessment of catchment rehabilitation needs. These ten criteria are:

- riverbank stabilisation;
- potential to enhance soil infiltration, stream flows and flood mitigation;
- sediment and nutrient filtering capacity, and potential to enhance water quality;
- erosion control potential (including coastal dunes);
- pest control potential;
- enhances biological diversity;
- enhances biological integrity;

- enhances habitat of rare and threatened species;
- enhances rare, restricted vegetation community or habitat type; and
- enhances ecofunctional areas (includes corridors, refugial areas, breeding areas, disjunct communities and ecotones).

The NQAA catchment health assessment method ranks the importance of the criteria in each category on a scale of zero to two ie; sites of critical significance for land and water conservation score two; sites which are significant but not critical for land and water conservation score one; and sites with limited significance for land and water conservation score zero. This process is repeated for ecosystem viability, making a maximum score of four.

An attribute is assessed as critically significant if it plays a necessary role in the continued, long-term functioning of the catchment. Without this attribute, or with this attribute degraded or impaired, the normal functions required to maintain a healthy catchment are greatly inhibited. These sites have a high priority for rehabilitation. Assessment details for each of the criteria are provided in Appendix 1.

Additional consideration is given to sites with limited significance that may have other important attributes, such as providing 'community value'. These sites have a low priority for rehabilitation. If this is assessed as; (1) providing a demonstration site for community education, (2) as a community resource or recreation site, (3) as a cooperative project with other organisations (eg., RIT, Landcare group), (4) as a significant public relations exercise and/or (5) under other criteria identified under the FNQ 2010 rehabilitation background paper (ie., scenic amenity, recreation/tourism potential, urban amenity or cultural heritage value), it receives an additional score of one point, bringing the maximum score to five.

3.3 Regional Rehabilitation Priorities in the Upper Mitchell Catchment

A number of regionally significant sites for biodiversity rehabilitation have been identified during the FNQ2010 planning process with the most critical of these areas being associated with riparian zones, wetlands and lowland rainforests. This list reflects widely recognised needs for replacement, consolidation, weed eradication and linkage of forest remnants. Links in the Julatten area through riparian strips and vegetation corridors are considered the most significant of the regional rehabilitation priorities. These sites are shown in Table 1.

Table1 FNQ2010 Regional Rehabilitation Priorities for Julatten - Biodiversity Values

Locality for Rehabilitation	Important Values Assisted by Rehabilitation
Devil Devil Creek	**R & T species habitat, ecofunctional area**, enhancement of biological diversity, rare/restricted community type
Bushy Creek	**R & T species habitat, ecofunctional area**, enhancement of biological diversity
other creeks in the Julatten area	**R & T species habitat, ecofunctional area**, enhancement of biological diversity, sediment filtering capacity, erosion control potential
Melaleuca, Fan Palm & **type**, Feather Palm Swamps	**R & T species habitat, rare/restricted community** enhancement of biological diversity

Entries in bold reflect the most significant selection criteria for that site

Additional high priority rehabilitation sites have been identified for land and water conservation issues. These sites are located in areas of the MDIA and are considered highly prone to salinity problems. Vegetation replacement, consolidation and retention is urgently needed in these areas to prevent the rapid decline of catchment health.

Table 2. Rehabilitation Priorities in the Upper Mitchell Catchment - Land & Water Conservation

Locality for Rehabilitation	Important Values Assisted by Rehabilitation
Biboohra area	Restricted community type, reduction of groundwater levels, decrease in salinity groundwater problems
Arriga area (MDIA)	reduction of groundwater levels, decrease in salinity groundwater problems

3.4 Specific Rehabilitation Priorities within the Upper Mitchell Catchment

Details of sites that could benefit from rehabilitation works are provided in Table 3. The study area has been divided into two sections; a Northern and a Southern. The Northern section contains sites in the Julatten and Maryfarms areas and the Southern identifies sites in the MDIA. Each site is given a reference number that corresponds to a location on Figure 2. Sites are listed according to the section of the catchment in which they are located with particular rehabilitation measures being recommended for each. All grid reference numbers (eg. GR 244625) given for specific site locations relate to 1: 50, 000 topographical sheets (Rumula, Mareeba and Tolga). A guide to species selection for rehabilitation works is provided in Appendix 2.

Table 3 Rehabilitation Sites for the Upper Mitchell Catchment Study Area

Site #	Location	Type of Rehabilitation Needed	Score	Comments
"FOCUS AREA"				
Devil Devil Creek (main branch)- major upper tributary of Rifle Creek flowing through rural subdivisions and sugar cane expansion area				
DD1	both banks of upper east feeder streams between GR's 266708 - 265700	riparian re-instatement/re-inforcement, weed control & stock exclusion (1.0km)	3	will assist in filtering sediment & nutrient inputs to stream & provide linkage to remnants
DD2	both banks of headwater streams between GR's 264705 - 263696	as above	3	as above
DD3	both banks of headwater streams between GR's 254701 - 263696	as above	3	as above
DD4	both banks of small feeder stream between GR's 255689 - 257693	as above (0.4km)	2	as above
DD5	both banks of small feeder stream between GR's 257686 - 264684	riparian re-instatement/re-inforcement, & weed control (0.5km)	1	as above - through rural residential area
DD6	both banks of feeder streams to north- east of Nine Mile Caravan Park including junction between GR's 267699-265700	riparian re-instatement/re-inforcement, weed(grasses) control & stock exclusion	2	will consolidate riparian regrowth, link remnants & reduce weed invasion & stream chokage
DD7	both banks of Devil Devil Creek to sth of Euluma Creek Rd (northern end)	thickening of riparian vegetation, weed control & stock exclusion (0.5km)	2	will assist in filtering sediment & nutrient inputs to stream & consolidate existing vegetation (linear in most areas)
DD8	both banks of tributary south of DD7	re-instatement of riparian vegetation, weed control & stock exclusion (2.0km)	2	will assist in filtering sediment & nutrient inputs to stream & reduce weed invasion
DD9	east bank of creek below DD8	thickening of riparian vegetation on creek (1.2km) & re-instatement along eastern feeder creeks	3	as above (especially with regard to sediment/nutrient inputs from adjacent sugar cane)
DD10	both banks of eastern tributary from GR's 288654 - 283652	riparian re-instatement	2	as above
DD11	both banks of tributary draining to north west off Rassmussen Rd	re-instatement of riparian vegetation, weed control & stock exclusion	2	will assist in filtering sediment & nutrient inputs to stream & reduce weed invasion & weed chokage
DD12	both banks of tributary to west of DD9	re-instatement of riparian vegetation	3	as above (especially with regard to sediment/ nutrient inputs from surrounding sugar cane)
DD13	both banks of tributary crossing Morrish Rd	re-instatement of riparian vegetation, weed control & stock exclusion (1.2km)	2	will assist in filtering sediment & nutrient inputs to stream & reduce weed invasion & chokage
DD14	east bank of main creek downstream of Euluma Creek Rd & DD13	thickening of riparian vegetation , weed control & stock exclusion	3	as above

Site #	Location	Type of Rehabilitation Needed	Score	Comments
DD15	both banks of small tributary - west of DD14	as above (1.3km)	2	as above
Devil Devil Creek (western branch) -				
WDD1	both banks of headwater tributaries between GR's 247685 – 259677	riparian re-instatement/re-inforcement & weed control (2.0km)	4	will assist in filtering sediment & nutrient inputs to stream & provide linkage to remnants
WDD2	both banks of tributary below WDD1	riparian re-inforcement (0.6km)	4	as above
WDD3	both banks of headwater feeder creeks west of Clacherty Rd	riparian re-instatement/re-enforcement, weed control & stock exclusion	3	as above - numerous small sections (0.2 -0.5km)
WDD4	both banks of tributary crossing southern end of Clacherty Rd	consolidation of existing riparian vegetation (0.6km)	2	will assist in filtering sediment & nutrient inputs to stream & provide linkage to remnants
WDD5	both banks of tributaries west of DD8 and DD9 to junction with main branch	consolidation of existing riparian vegetation, weed control & stock exclusion	3	as above
WDD6	both banks of tributary below WDD5	as above (1.2km)	3	as above
Bushy Creek - major tributary of Rifle Creek and can provide major linkage between WTWHA and latgely vegetated Bushy Creek				
B1	south bank of creek 0.5km downstream from southern WTWHA boundary	riparian re-instatement/re-enforcement, weed control (mainly grasses & lantana) 1.0km	4	consolidation of extremely diverse vegetation community and wildlife habitat (NB: Navua Sedge first occurs in adjacent paddocks at the upper-most causeway GR209667)
B2	downstream of bridge on Mt Lewis Rd	control of running bamboo patches for next 0.5km) & other weeds (Navua Sedge, Sicklepod, Lantana & Hammil Grass)	3	removal will prevent further colonisation downstream
B3	west bank downstream of B2 to junction with Lerra Creek	riparian re-instatement & weed control (Navua sedge, bamboo & sicklepod - 0.5km)	5	will assist in filtering sediment & nutrient inputs to stream & consolidate wildlife corridor link between Mt Lewis & Mt Danbulan
B4	both banks downstream of B3 to Kingfisher Caravan park (including feeder creeks)	as above - (2.0km)	5	as above (no vegetation at all)
B5	both banks downstream of B4	*Thunbergia laurifolia* & *T. alata* treatment including ongoing management to prevent reinfestation and spreading	4	Thunbergia infestation has been treated before but is persisting
B6	both banks upstream of McDougall Rd causeway	riparian re-instatement/re-enforcement & weed (especially Para grass) control	4	will assist in filtering sediment & nutrient inputs to stream & provide linkages

Site #	Location	Type of Rehabilitation Needed	Score	Comments
B7	both banks downstream of B6 (0.8km) to junction with Rocky Creek	as above	4	Mareeba shire WTTPS riparian revegetation project (planted in 1992-1994)
B8	below B7 to causeway on Mossman/Mt Molloy Rd	riparian re-instatement/re-enforcement & weed (mainly grasses)control - 400m	5	will assist in filtering sediment & nutrient inputs – also important for preventing the further spread of *Hymenachne* from adjacent floodplains
BT1	both sides of tributary to north west of Kingfisher Park	as above	4	will assist in filtering nutrient & sediment inputs to stream & provide linkages to remnants
BT2	tributaries east of Mossman/Mt Molloy Rd through sugar cane from GR234648 to Bushy Creek junction	as above	3	as above
BT3	both banks of western tributaries north of McDougall Rd to the junction with Bushy Creek	as above	3	as above
Nissen Creek - small tributary draining southern side of Mt Perseverence				
N1	small feeder creeks crossing Mt Perseverence Rd	riparian re-instatement & weed control	2	as above
N2	both banks of eastern tributaries east of N1	riparian re-instatement/re-inforcement & weed control	2	as above
N3	Tributaries (3) to north east of Carr Rd	as above	2	as above - mainly consolidating existing regrowth
N4	both banks of tributary at GR's 220674-224673	as above	2	will assist in filtering nutrient & sediment inputs to stream & provide linkages
N5	feeder streams below N4	consolidation of existing riparian vegetation, weed control & stock exclusion	2	as above
N6	eastern tributary crossing the Mossman/ Mt Molloy Rd north of the Mt Lewis Rd turn off	as above	3	as above
Rocky Creek - small tributary of Bushy Creek; good corridor linkage opportunity between Mt Lewis State Forest and Bushy Creek				
R1	both banks of creek between GR212637 to junction with Bushy Creek	as above	4	as above - good opportunity to link well vegetated lower end of Bushy Ck with Mt Lewis (some work already undertaken by landholder)
R2	both banks of western tributary of R1	as above	3	will assist in filtering nutrient & sediment inputs to stream & provide linkages

Site #	Location	Type of Rehabilitation Needed	Score	Comments
Butcher Creek - small tributary of Bushy Creek				
BU1	both banks of lower creek from GR208626 to GR217612	consolidation & re-instatement of riparian vegetation & weed control (2.0km)	4	as above - especially important in floodplain sugar cane areas
Hunter Creek - important tributary of Bushy Creek; water supply for Mt Molloy				
H1	both sides of creek up- stream from bridge on main road	thickening of riparian vegetation & stock exclusion (1.2km)	2	linear vegetation in some areas requires widening
HO	Hunter Creek overflow - wetlands with few Naucleas adjacent to Hunter Ck	removal of *Hymenachne amplexicaulis* and management to prevent re-invasion	5	to prevent further spread in the Julatten area – especially into creek systems where increased sedimentation could result in increased flood frequencies
Boggy Creek wetlands - north of the Rifle and Bushy Creek junction & fed by Boggy Creek				
BW	west of McLeans Bridge Rd	as above	5	as above
BWT	both banks of intermittent feeder creek east of BW	riparian re-instatement, weed control & stock exclusion (1.0km)	2	no tree cover exists at all - will assist in filtering nutrient & sediment inputs to
Rifle Creek – major tributary of the Mitchell River				
Ri1	Approx. 7km north east of Mt Molloy, accessed by Wetherby Road	Riparian reinstatement	2	will assist in filtering nutrient & sediment inputs to
Ri2	North west of Ri1	As above	2	As above
Ri3	Both banks of feeder creek from GR255607 to GR260611	As above	2	As above
Ri4	Eastern feeder creek 1km north of Wetherby Station	As above	3	Will provide connection with mesophyll forest on ranges east of Wetherby with Rifle Creek
Ri5	Small dam east of Rifle Creek adjacent to road junction of Peninsula Development Road & Mossman Road	Removal of *Salvinia* infestation	5	This poses a major threat to the Mitchell River and associated wetlands downstream
Dairy Creek - tributary of Rifle Creek that flows past abondoned copper smelter and discharges high Concentrations of heavy metals				
D1	both banks of creek west of Mt Molloy township	riparian re-instatement/re-inforcement & weed control (0.2km). Also revegetation of discharge source from old mine site	3	will assist in filtering nutrient, sediment & heavy metal inputs to stream
"GENERAL - Study Area"				
McLeod River - major tributary of the Mitchell River draining the western side of the Windsor and Carbine Tablelands				
MC1	both river banks from the State	eradication of *Cryptostegia*	3	uppermost source of

	Forest boundary to the junction with the Mitchell River	*grandiflora* and ongoing management		*Cryptostegia* in this sub-catchment; will reduce invasive potential and seed source for Mitchell catchment and assist in enhancing productive potential
Spencer Creek- northern tributary of the McLeod River draining directly off the Windsor Tableland				
SP1	both banks from the State Forest boundary to the junction with the McLeod River	as above	3	As above

Site #	Location	Type of Rehabilitation Needed	Score	Comments
Mary Creek - major tributary of the Mitchell River draining the western side of Mt Lewis & Mt Perseverence				
Ma1	adjacent to north bank of Mary Creek north east of Maryfarms	eradication of *Cryptostegia grandiflora* and ongoing management	3	Uppermost source of *Cryptostegia* in this sub-catchment; will reduce invasive potential and seed source for Mitchell catchment and assist in enhancing productive potential
Ma2	Both banks of Mary Creek down to the junction with the Mitchell River	Control and Management of weed species such as Rubber Vine, Passiflora sp.and exotic grass species	2	
Mitchell River -				
Mi	Entire Mitchell River from north of Biboohra	Control Cryptostegia grandiflora and ongoing management. Stock exclusion from riparian area	3	Prevent further spread of weed species throughout the catchment and reduction of sediment supply through stock management
XX1	0.5km north of Carr Creek on Peninsula Development Rd	stabilisation of actively eroding gully areas and improved pasture management	2	Reduction of sediment supply
XX2	opposite Lake Southedge	as above	2	Reduction of sediment supply
XX3	dismantled railway line south of Mt Molloy adjacent to Peninsula Development Rd	stabilisation of actively eroding areas and improved pasture management	2	Reduction of sediment supply
Mareeba-Dimbulah Irrigation Area (MDIA)				
Four Mile Creek - tributary at headwaters of Mitchell Creek draining off the Hann Tableland & through an area of sugar cane expansion with possible salinity problems				
F1	both sides of the creek between GR269255 and the junction with Two Mile Creek (GR 283310)	riparian re-enforcement and weed control especially Para Grass (6.0km)	5	will assist in filtering nutrient & sediment inputs to stream also very important for preventing rises in groundwater levels & associated salinity problems
Two Mile creek - tributary at headwaters of Mitchell River passing through an area of sugar cane expansion with possible salinity problems				
A1	Adil Rd drain at GR293236	removal/treatment of ponded pasture *Hymenachne amplexicaulis*	5	to prevent further spread
T1	floodplain between the sewage treatment plant and Two Mile Creek (off Adil Rd)	reinstatement of floodplain vegetation and installation of biological filtration measures	5	will assist in filtering nutrient inputs from sewage overflow
T2	both sides of the creek between GR's 286247 - 283310	riparian re-inforcement and weed control especially Para Grass (7.0km)	5	will assist in filtering nutrient & sediment inputs to stream (especially from any sewage overflow) -also important for preventing

	rises in groundwater levels & associated salinity problems.

Site #	Location	Type of Rehabilitation Needed	Score	Comments
TFX	wetland systems between Two Mile and Four Mile Creeks west of Biboohra	wetland vegetation consolidation, weed eradication (including the legume *Centrosema pubescens*, *Cryptostegia grandiflora* and *Hymenachne)* and long term management	4	will assist in filtering nutrient and sediment inputs and help reduce groundwater levels and salinity groundwater problems
GG1	Greens Gully - feeders of Dingo Creek approximately 12km west of Mareeba	riparian vegetation reinforcement and removal of Para grass	3	removal of Para grass 'sediment trap' and replacement with riparian vegetation will reduce fire risk and help lower groundwater levels and associated groundwater salinity levels

4.0 Terrain, Parent Materials & Soils

The Upper Mitchell catchment contains mountainous areas in the north, south and central regions. Elevation in the north and north-east attain heights of greater than 1300m above sea level with Mt Spurgeon (1322m), Windsor Tableland (1359m) and Mt Lewis (1224m). Bakers Blue Mountain - a biogeographically isolated range to the west of Mt Molloy - and the Hann Tableland in the centre also have peaks greater than 1000m above sea level.

These mountainous regions are extremely rugged and composed of granite outcrops and mainly granite derived soils. At lower elevations (400-800m) in the Julatten area the soils are of metamorphic origin derived from the Hodgkinson Formation. Well-drained soils on alluvium occur around all the creek systems and usually contain mixtures of the two parent materials, Hodgkinson metamorphics and granite (Murtha 1989). Isolated small patches of organic soils and peats also occur in conjunction with freshwater wetlands along Rifle creek.

The southern region, below Dimbulah, is bounded by mountains with elevations between 800m and 1000m above sea level. This includes the Herberton Range and the Irvinebank - Stannary Hills area. Soils in this region are of metamorphic and granitic origin but tend to be very shallow, stony and low in nutrients. The Irvinebank - Stannary Hills area, in particular, is of great interest botanically due to the extreme variability in the geology in combination with the high altitude (Clarkson pers. com.).

Lower elevations to the north and north-west of Mareeba form the Mt Carbine-Mareeba Plain which extends for over 80km (Jensen et al., 1996) and forms the headwaters of the Mitchell River. To the south, in the MDIA, the Walsh River drains a wide, shallow valley from east to west. Erosion from the highlands surrounding both these 'plains' has produced accumulations of alluvial and colluvial deposits.

To ensure a healthy catchment, soils need to be:

- stable to prevent erosion from wind, water and human impacts;
- fertile to provide nutrients for growing crops and native vegetation;

- clean and free from pollutants for the soil fauna which are important to nutrient cycling; and
- well-structured to provide air and space for plant roots, soil organisms and water.

4.1 Erosion Susceptibility

Generally it is the terrain that will determine the extent to which erosion is likely to occur. However, ground cover (eg. vegetation) has a greater influence on erosion than any other factor. Cover reduces erosion primarily by decreasing the overland flow velocity which reduces the waters ability to detach and transport sediment (Rose & Freebairn, 1983).

Erosion damages the soil structure deposits eroded materials into streams leading to; infilling, diversion of channels and weed invasion. This in turn can then result in higher peak flows and increased flood frequencies. Soil erosion has severe impacts on land productivity through the removal of topsoil with run-off and by disrupting the soil profile, often bringing infertile subsoils to the surface (Wilmott, 1984). Resulting floods also severely impact public infrastructure such as roads, bridges and dams. In cane producing areas of north Queensland erosion rates of 300 tonnes per hectare per year have been recorded (Freebairn et al., 1996) with evidence that most sediment enters streams from the headwaters of catchments (Karr & Schlosser 1978).

Though erosion is largely related to terrain, some soil types are more susceptible to erosion than others. DNR have specified constraints for agricultural development based on upper slope limits for certain soil types. For soils derived from metamorphic parent materials the upper slope limit set is 15% and soils derived from granitic rocks have a upper limit of 12%, with granite derived soils being more susceptible to erosion. The QDPI (Capelin & Murtha, 1983) recommended the maximum slope suitable for sugar cane production in the Julatten area is less than 6%.

There is large potential for soil erosion in many areas of the Upper Mitchell Catchment. All soils in the MDIA derived from granite and metamorphics have been identified as highly susceptible to soil erosion from rainfall and overhead irrigation (Capelin, 1985). Similarly, the alluvial soils of Hunter Creek and Upper Bushy Creek (north of Hunter Creek), in Julatten, occurring on the lower terraces and subject to frequent flooding, have also been identified as subject to erosive processes (Murtha, 1989).

4.2 Potential Salinity Problems

The DNR and DPI jointly carried out an extensive study (Jensen et al. 1996) to determine the effects of clearing and subsequent irrigation on the quality of the groundwater in the MDIA. The study looked at known risk areas of potential groundwater and salinity problems in the Upper Walsh and Upper Mitchell catchments. Areas studied in detail included; Cattle Creek/Arriga, Biboohra and Leadingham Creek.

Vegetation clearing and cropping changes the water balance by reducing the quantity of water leaving the system through evapotranspiration. Excess water percolates below the root zone into the groundwater (water table) system resulting in a build-up of pressure and inability of the groundwater to naturally drain off. This gives rise to an increased water table where excess water allows for the mobilisation of salts stored in the soil profile (Jensen et al., 1996).

Increased irrigation practices are believed to add to the problem by adding excess water to the system and the use of trickle or sprinkler irrigation is considered preferable to flood irrigation (Jensen et al., 1996). It is noted by Rose et al (1996) that irrigation in the cattle Creek area of the MDIA has doubled since 1992. This gives great cause for concern with regard to the likelihood of major salinity problems occurring in the future.

5.0 Water Resources

The streams and creeks of the study area are mostly perennial in the north and north-eastern sections where they flow from elevations greater than 1000 metres within rainforests of the WTWHA. Similarly, in the southern section of the study area where the Walsh River and its tributaries collect from the Herberton Range. The majority of small drainage creeks present in the open woodland country representing the remainder of the study area tends to completely dry out towards the latter "dry-season" period. All these systems experience annual floods that are necessary to flush out and rejuvenate the catchment. Floods also deposit sediments and nutrients on grazing lands downstream, replenish and connect lagoons for increased fish movement and create the necessary conditions for successful larval and juvenile rearing (Hogan and Vallance 1997).
The natural hydrology of a catchment is complex and features many elements that are crucial to the sustainability of aquatic processes and maintenance of water quality (QDNR 1997). There have been significant alterations to the natural drainage patterns within the upper catchment. These are most obvious in the MDIA where a series of open channels and pipes direct water from Tinaroo Dam in the Barron Catchment throughout the developed agricultural lands in the Upper Walsh and Upper Mitchell areas for irrigation of a wide range of horticultural crops - most notably sugar cane. The Walsh River itself was naturally intermittent but is now permanently supplemented with water from Tinaroo Dam. Water from the West Barron main channel enters the Walsh River upstream of two existing weirs; Bruce and Leafgold. The Mitchell River system is also supplemented with water from Tinaroo via Two-Mile Creek to the northwest of Mareeba. The continued use of irrigation has long term effects on catchment health both at a small-scale farm level and also downstream. These include; increased salinity problems, rising water tables, pollution of waterways, increased sedimentation and alterations to the ecological values (Johnston et al, 1996).

5.1 Water Quantity

There are impediments to natural flows in the Rifle Creek sub-catchment, on the Mitchell River and within the MDIA. The large water storage on the Mitchell River (Lake Southedge) is currently non-utilised and has the capacity to store 130,000 ML (DNR 1997). There is also an application in process to construct a second dam on the Mitchell River immediately downstream of Lake Southedge.

Several small weirs are present in the Rifle Creek area for the purpose of irrigating sugar cane. Julatten residents have observed that water flows in Devil Devil Creek drop considerably towards the end of the dry season relative to years prior to the development of rural residential subdivisions (dependant on bore or creek water for domestic use) and sugar cane expansion. Water consumption for the Julatten and Mt Molloy areas of the upper Mitchell measured in 1995 totalled 1,143 megalitres and is predicted to rise drastically within the next 15years to 50,995 megalitres as a result of the increased irrigation requirements (DNR 1997). This estimated increased water demand of 98% would place tremendous pressure on the riparian ecosystems in these areas.

Water holding capacities in the MDIA are represented by four weirs in the Walsh catchment which have a combined holding capacity of 2,702 ML (DPI 1995). These weirs are; Collins, Leafgold, Bruce and Solanum. Water supplies from MDIA are now fully committed (DNR 1997) yet there are ever increasing demands for more water. With the decline of the tobacco industry many farmers have turned to sugar cane as a substitute crop which has far greater irrigation demands. This has lead to the revitalisation of the Nullinga Dam proposal. The proposed dam is downstream of the present Collins Weir and upstream of the existing Bruce and Leafgold Weirs and would have a capacity of 297200 ML (Hogan and Vallance, 1997). These authors have expressed concern because of the likelihood of increased sedimentation downstream resulting in

changes to catchment hydrology and a reduction in water quality. There are also numerous small dams for the purpose of domestic use, cattle grazing and mining.

With the continuation of the rapid urban development on the wet tropics coast the sugar mills are turning to the tablelands and MDIA for further sugar cane expansion (QDPI, 1995) placing more urgency on the need to limit water harvests from catchments. A Water Allocation Management Plan (WAMP) is in the development process for the MDIA (upper Walsh River) as part of the Barron catchment. This process will allocate water entitlements to competing demand sectors and will also provide water allocations to the environment in order to maintain healthy, sustainable waterways. A draft WAMP for the Mitchell River system is not due for completion until 2001 (DNR 1997). It is clearly stated in the *FNQ 2010 Steering committee Report on the Environment* (p181, 1997**) it is critical that appropriate water use limits are set and the region encourages types of developments that do not set unacceptable demands or impacts on water resources.**

5.2 Water Quality

The water quality of the upper Mitchell study area is generally perceived to be good although there are problems associated with nutrients and groundwater salinity levels. Activities within the area which lead to a decline in water quality include; tree clearing, agriculture, grazing, and mining. These impact in the form of nutrient and sediment inputs, increases in groundwater salinity and acid mine discharge.

Nutrient inputs into crops are often lost from the system via processes such as run-off, denitrification and leaching through the soil profile. This represents an economic loss to farmers and has environmental consequences. Studies (Congdon & Lukacs 1996) in the Burdekin cane growing region monitoring water quality drainage from areas that have been cropping cane for 25 years showed the highest nutrient concentrations. It was also shown that chronic inputs of nutrients during the dry season are of greater significance to floodplain wetlands because they are more prone to algal blooms during periods of low flows.

In Hogan and Vallance's (1997) initial appraisal report of the proposed Nullinga Dam they state their concern regarding the possible outbreak of algal blooms in the MDIA as a result of the reduction in water flow, increased nutrient loads (especially phosphorous which is applied to crops using flood irrigation to maintain productivity eg sugar cane) from cropping, and the hot and still conditions normally experienced in the area. Most algal blooms add toxins to the water which pose a health threat to humans and animals if physically contacted or ingested. A number of serious fish kills have already occurred in streams surrounding new sugar cane growing areas where the deaths have been associated with an increase in nutrient and organic levels (Hogan & Vallance 1997).

Research carried out by DPI and CSIRO (Fullelove 1996) in the Bundaberg cane growing and horticultural districts have shown agricultural practices had a significant effect downstream through the degradation of the groundwater quality. High levels of fertiliser nitrates were found in the groundwater. Current water quality monitoring in the Upper Walsh River and Rifle Creek (Julatten) areas of intensive agriculture have shown definite declines in water quality as a result of high nutrient levels (Ryan pers. comm.). Water sampling from Two Mile creek has also shown high nutrient levels, presumably from the sewage overspill from the near-by treatment plant.

Rising groundwaters have been identified as a major problem (Jensen et. al. 1996) in the MDIA because of its association with potential salinity problems. Very high salt concentrations of greater than 12,800 ppm have been found in some shallow aquifers on Arriga Flats in the MDIA. This is way above the recommended maximum desirable level for human consumption (640 ppm) and the recommended maximum drinking water for cattle (10560 ppm - Rose et al 1996). There is a serious threat that poor quality saline groundwater in the Cattle Creek sub-catchment

of the MDIA could rise sufficiently to discharge into Cattle Creek and then into the Walsh River effecting tobacco growers downstream who use the river water for crop irrigation.

Many crops, such as tropical grasses, can tolerate salinity levels of up to 3328 ppm. However, research has shown that sugar cane experiences a 25% drop in yield reduction under average conditions if the salinity of the irrigation water used increases from 1408 ppm to 2240 ppm (Rose et al, 1996). Yo and Shaw (1990) showed that a yield loss would be experienced for mango, grape, capsicum, maize & citrus crops for irrigation water applied with salinity greater than 704 ppm. Saline levels for groundwater held in the Arriga balancing storage bores were recorded at 1408ppm which is unsuitable for those crops mentioned above.

Areas of high to very high salinity hazard were found in the heavy and medium to heavy clays of the Arriga and Biboohra areas (Jensen et. al., 1996). Extensive land clearing, cultivation and irrigation of these areas will increase the groundwater levels and the level of salt water intrusion thereby reducing water quality. A large portion of the Biboohra area is already under sugar-cane cultivation with further expansion underway.

Recent monitoring of acid mine discharges (AMD) from several abandoned mine sites within the study area indicates that heavy metal contamination into waterways does occur. However in most cases the heavy metal concentrations had returned to normal levels within two kilometres downstream. Bartareau et. al (1998) indicated this was not the case for discharges from Baalgammon mine (situated at the headwaters of Jamie Creek near the Watsonville settlement) and Orient mine (on Murphy's Creek upstream of the Solanum weir in the MDIA). High concentrations of heavy metals (Baalgammon = As, Orient = Cd and Pb), greater than guidelines recommended by ANZECC (1992) for human and stock consumption, were found to persist at distances greater than two kilometres downstream from the outlet point of AMD. Although these results are derived from a limited amount of sampling the authors recommend the need for further investigations and some remedial action to prevent degradation of the catchment through the accumulation of heavy metals, some of which may be toxic to aquatic organisms.

5.3 Wetlands

A number of wetlands occur in the upper Mitchell River study area on organic peats and soils in the Julatten-Mount Molloy area and on the medium to heavy clays of the Biboohra area. These include woodlands dominated by *Melaleuca spp.*, *Eucalyptus tereticornis* and *Lophostemon suaveolens* often with additional mesophyll species present such as Leichardt Trees, *Nauclea orientalis*. These are similar in structure to the swampy coastal plains which have now been largely cleared for sugar cane (Tracey, 1982). Wetlands are extremely complex and dynamic ecosystems, in which sediments collect, nutrients are recycled and water is purified. They also shelter and sustain an enormous diversity of wildlife. The threat of wetlands being cleared for sugar cane expansion is of great concern because these areas can protect saline prone soils and have the ability to detain sediments and overland waterflows. Wetlands of the area are also currently threatened by massive invasions from aggressive weed species, in particular *Hymenachne amplexicaulis*, and other improved pasture species. Wetlands include;

- McLean Bridge Rd wetlands
- Abbatoir Swamp
- Two Mile Creek/Four Mile Creek
- Goose Swamp waterhole
- Tt–Tree Swamp
- Molloy Lagoon
- Mareeba Wetlands & Lake Southedge (man-made)

All these wetlands occur in the low-lying plains adjacent to the major permanent creek systems in the upper catchment and provide extremely important wildlife habitat. Many of the wetlands also have recreational and tourist values

6.0 Vegetation

The vegetation of the upper Mitchell catchment reflects its position in the landscape. The area is an overlap in biogeographical sub-regions - the Wet Tropics and Cape York Peninsula, and provides for an increased level of species diversity. The vegetation varies greatly, from the species-rich rainforests of the uplands and eastern creek systems to the open, sclerophyll woodlands, which dominate much of the western and southern sections of the study area. With the exception of the Julatten and MDIA agricultural sections, a large percentage of the upper catchment still retains much of it's natural vegetation, more than likely due to the mountainous terrain and/or the aridity and remoteness of these areas.

6.1 Importance of Riparian Vegetation

The natural vegetation of the landscape has many functions in maintaining catchment health. Much research in the previous decade has shown that the retention of natural vegetation along creek and river banks, the riparian zone, has a large and positive direct impact on water quality through moderating sediment and nutrient inputs (in both overland and groundwater flows), providing roughness to reduce the flow of floodwaters, provision of bank stability thereby reducing erosion and shading out exotic weeds (Wilson et al, 1993; Herron 1993; Arthington et al., Nullinga; Hairsine ,; Quinn et al,1993; Bunn, 1998; Riding and Carter, 1992; Smith,1992; Vought et al, 1995). Riparian zones also serve ecological functions by providing; wildlife corridors, aquatic food sources through leaf litter drop, and provision of shade for greater instream habitat.

It is now widely recognised that riparian vegetation plays a major role in subsurface nitrate removal (Quinn et al, 1993) and assists in the prevention of toxic algal blooms by regulating the instream primary production. This is achieved by shading of the channel, which reduces the light intensity and decreases the water temperature (Wilson et al, 1996). This channel shading also prevents the invasion of exotic species, such as Para Grass which cause channel chokage resulting in higher flood peaks and increased flood frequencies (Bunn et al 1998).

The riparian zone is extremely important because it links the terrestrial and aquatic ecosystems. Recognition of the importance of riparian retention, protection, management and reinstatement has lead to the development of a national research and development program on riparian zones. In the 1993/1994 financial year the Land and Water Resources Research and Development Corporation (LWRRD) embarked on a five-year national research program. This program is aimed at developing guidelines for effective and economic management of riparian vegetation in order to help maintain or improve the condition and values of streams, wetlands, lakes and their associated terrestrial ecosystems (Price, 1993).

6.2 Description of Vegetation Types

The study area supports a high diversity of vegetation structural types with 12 of the 17 main rainforest types described in Tracey (1982) being present. The dominant vegetation community in the Upper Mitchell River catchment is a mix of tropical eucalypt woodlands, which occur in the drier climatic areas, usually on poorer soils. Rainforests are present on richer soils in high rainfall areas in the northeast and southeast regions of the study area with the exception of outliers found on the Hann Tableland and in the Bakers Blue Mountain range. Tall open forests occur in the moist uplands and highlands, usually as a narrow band on the western fringes of the rainforest communities (Tracey, 1982). Wetlands are limited in distribution to the poorly drained sites.

Brief descriptions are given below for each of the structurally different vegetation types, following the generally accepted classification system devised by Tracey and Webb (1975; described in

greater detail in Tracey, 1982), with examples of their location in the study area.

Wetlands
Several small wetlands are present in the Julatten and Biboohra areas adjacent to Rifle Creek and between Two-Mile and Four Mile Creek. These depict medium open woodlands and tall open forest communities on heavy clays, which have poor drainage capabilities when waterlogged. The dominant species present include *Melaleuca spp*., *Eucalyptus tereticornis* and *Lophostemon suaveolens* (these represent combinations of types 15a, 18, 19 and 20, Tracey, 1982). Man-made wetlands also exist on the Mitchell River northwest of Mareeba (Lake Southedge) where the dominant open woodland community (type 16h) has been flooded.

Tall Open Forest
These forest types are found in two areas. On the western falls of the Herberton Range and the Carbine / Windsor Tablelands. The prominent features of these forests are the towering eucalypts; Flooded Gum, *Eucalyptus grandis* and Red Stringybark, *Eucalyptus resinifera*, which can reach heights of up to 45 metres (type 14a and 14b).

Rainforest Communities
There is considerable variation which may be correlated to microsite differences (Tracey, 1982). Several structural types of rainforest are represented. These can be divided into the four groups below according to the different combinations of growth forms present (eg. trees, vines, palms, ferns) and their various heights and spacings (vegetation types in brackets below are from Tracey, 1982);
(i) Mesophyll Vine Forest (MVF) - composed of several tree layers with high species diversity and many varieties of life forms. These forests occur in the wet and very wet areas of the Julatten and eastern mountainous zones on soils derived from granite (type 2a). A distinct vegetation type occurs in the headwaters of Devil Devil Creek on seasonally impeded drainage soils and is dominated by the spectacular Fan Palm, *Licuala ramsayi* (type 3b). MVF also extends into the drier zones on deep river alluvia such as along Rifle Creek to the west of Mount Molloy (type 1c).
(ii) Notophyll Vine Forest (NVF) - grows on the granites at high altitudes of the mountainous regions in the wet and very wet areas of Mt Lewis, Mt Spurgeon, the Carbine Tableland and Bakers Blue to the west of Mt Molloy (types 8, 9 and 10). The presence of Queensland Kauri Pine, *Agathis robusta*, usually indicates a drier version of NVF (type 6) in which some deciduous canopy species; Acacia Cedar, *Paraserianthes toona* and Burdekin Plum, *Pleiogynium timorense*, are present. This rainforest is prominent at low altitudes on Bakers Blue, in small patches of the south-eastern end of the Hann Tableland and at the headwaters of Spear Creek to the east of Mt Molloy.
(iii) Vine Forest with Acacia and Eucalypt Emergents - signifies an intermediate forest type resulting from disturbance such as logging or land clearing. The dominant species present include *Acacia spp*., *Eucalyptus pellita*, Cadagi; *Eucalyptus torelliana*, and mixed vine forest species occur in the understorey. Examples are found on the eastern footslopes of Mt Frazer, Mt Lewis and many ridges in the Julatten/Mt molloy area. Approximately 75% of the Devil Devil Creek catchment is composed of this intermediate forest type (types 12a, 12c and 13b).
(iv) Deciduous Microphyll Vine Thicket (DMVT - type 11) - occurs in drier regions usually associated with granite outcrops. A substantial area of Bakers Blue Mountain represents this vegetation type. Sporadic occurrences are also likely to occur throughout the drier, western parts of the Upper Mitchell Catchment wherever fire-free niches exist. Common species characteristic of DMVT includes the deciduous species; Kapok, *Cochlospermum gillivraei* and Bombax*, Bombax ceiba*.

Woodland Communities
The woodland forests are dominated by Eucalypt species but vary greatly across the region depending on site-specific features. The most widespread woodland community consists of Molloy Box*, Eucalyptus leptophleba* (type 16h) and has many other mixed species present. A

varying vegetation type with Lemon Scented Gum, *Eucalyptus citriodora*, grows in the dry, coarse-grained granite soils of the western uplands on Mt Windsor and Mt carbine (type 16i). Another variation exhibits Dead Finish, *Eucalyptus cloeziana*, as one of the dominant species and grows in moist, shallow soils in the Watsonville ranges and to the east of Collins Weir. The sclerophyll woodland communities within the study area show structural and floristic affinities with types 16b, 16c, 16e, 16g, 16h, 16i, 16j and 16m (Webb and Tracey, 1975). Many important woodland vegetation types exist in the southern region at high altitudes, on highly variable, impoverished soils of the Stannary Hills-Irvinebank-Petford area. Large concentrations of unique plant species such as the purple-flowered wattle, *Acacia purpureapetala* occur here. Due to their extremely limited distribution they are classified as rare and threatened under the *Native Plants Subject to the Nature Conservation legislation* (QDEH 1996).

6.3 Important Vegetation Types

Some of the vegetation communities in the area are now considered to be very rare or restricted in their occurrence. These include Mesophyll Vine Forests dominated by Fan-palms, Notophyll Vine Forests on mountaintops in windswept locations, Swampy Plains and Mosaics and Tall Open Forests (DoE 1997). The distribution of these vegetation types is mainly as small patches, many of, which have been isolated from the surrounding native vegetation by the extensive clearing that has occurred for agriculture.

The rare and threatened vegetation communities occurring within the catchment study area, as outlined in the *FNQ 2010 - Steering Committee Report on the Environment* (1997) are shown in Table 3. The FNQ 2010 Planning Process only covers the wet tropics region and does not extend into the drier, woodland areas, which cover much of the upper Mitchell catchment. Many unique plant communities containing rare species with limited distributions exist in the southern region to the west of the Watsonville Ranges at high altitudes. These have also been included in the table and included under 'woodlands'.

Table 3. Rare and Threatened Vegetation Communities in the Upper Mitchell Catchment

Vegetation Description	Vegetation Type
Mesophyll Vine Forest	1c and 3b*
Notophyll Vine Forest	10
Tall Open Forests	14a* and 14b*
Melaleuca swamps and swampy plains	15a*, 18*, 19* and 20*
Woodlands	variations of type 16**

* Denotes communities considered to be of exceptional significance and in need of the most urgent protection (DoE 1997).

6.4 Important Plant Species

There are at least 46 species occurring within the upper catchment that are officially regarded as rare and/or threatened (Wildlife Regulations 1994). If anything, this an underestimate of the total number of important species that do occur in the study area. As mentioned in section 6.3 very little survey work has occurred in the drier woodland regions, which make up a large percentage

of the area. To date intense and detailed species inventories have mainly been performed in the Wet Tropics region.

A total of 39 rare and/or threatened species, representing 85%, are found in the wet tropics regions (including the Baker Blue Mountain outlier) of the study area, with the remaining 7 species, representing 15%, occurring in the open woodland country in the southern section. The 85% of important plant species represented in the wet tropics areas are generally well protected under the WTWHA. The greatest concern regards the two species listed as endangered. These are the tamarind, *Toechima pterocarpum*, and *Sankowskya stipularis*, both found in the Julatten area (DoE 1997) with limited known populations. These two species have been identified in the *FNQ 2010 Steering Committee Report on the Environment* 1997 as "critically endangered and targeted for the highest priority recovery action". The largest threat to these two species is the continued sugar cane expansion. The Cooktown Orchid, *Dendrobium bigibbum*, also occurs in the study area and is noted as vulnerable.

Two species thought to occur in woodlands of the MDIA (fertile material is needed to confirm the identification) and listed as endangered and rare respectively are; *Cajanus mareebensis and Phyllodium pulchellum* (Werren, 1995).

Woodlands of the Irvinebank-Stannary Hills area contain 5 of the 7 rare and/or threatened species with 4 of the 5 listed as vulnerable. These are the Purple-flowered wattle, *Acacia purpureapetala*; the Orange-flowered Grevillea, *Grevillea glossadenia*; *Macropteranthes montana*; and the Red-Throated Bloodwood, *Corymbia rhodops*. These species have a relatively 'safe' status with the major likely threat being the commencement of large-scale mining activities.

The fragmentation and isolation of patches of vegetation affects many of these plants, in addition to the impacts of changed fire regimes, altered drainage patterns, grazing, mining, feral animals (particularly pigs) and weed invasions.

6.5 Weeds

Weeds in the upper Mitchell catchment are a major problem, severely impacting on biodiversity maintenance and catchment functioning. Infestations of these species are mainly concentrated on the richer soils in the higher rainfall areas and along the waterways. Those species impacting on catchment health and requiring priority attention in the study area are listed in Table 4. Weeds indicated as being of low or medium priority in the table are not considered as great a priority because they may be more of an agricultural land management problem (eg. Sicklepod, Giant Rat's Tail) with little overall impact on biodiversity and catchment health AND/OR they may be localised problems easy to contain in the short term.

Of the high priority weeds listed, Rubber Vine and Thunbergia have the most obvious impact by smothering the native vegetation. These leave a monospecific exotic as a replacement for a naturally diverse community which supports many life forms thus reducing the biodiversity within the region. Rubber Vine is believed to cause the largest amount of destruction to riparian

Table 4 Priority Weeds in the Upper Mitchell Catchment

Common Name	Botanical Name	Priority	Distribution & Comments
Rubber Vine	*Cryptostegia grandiflora*	high	Concentrated in MDIA to Paddy's Green and Collins Wier. Large infestations occur in the Mt Carbine / McLeod River area native gallery forests are being smothered.

Rubber Tree	*Calotropis procera*	low	Isolated occurences in the MDIA.Generally not consider- ed a major problem but has potential to outcompete native vegetation on creek banks and is hard to erradicate once established (Van Haaran,1995)
Singapore Daisy	*Widelia trilobata*	high	Small infestation on private property in upper Churchill Creek, Julatten has potential to spread through whole Bushy Creek system. "Smothers ground cover vegetation
Hymenachne	*Hymenachne amplexicaulis*	high	Large areas present in floodplains of the McLean Bridge Rd area, Hunter Creek floodplain & small patches around Two Mile Creek & Lake Southedge. High potential to further invade wetlands and non-vegetated creek banks .
Parthenium	*Parthenium hysterophorus*	high	Present at only one location in Julatten area - has been treated- follow-up inspections required. Highly invasive of disturbed areas, pasture and woodlands .
Giant Rats Tail	*Sporobolous pyramidalis*	low	Scattered and becoming more widespread. Agricultural pest.
Laurel Clock Vine	*Thunbergia laurifolia*	high	Isolated occurrence on Bushy Creek has been treated but is persisting. Also present in some private yards. Completely smothers remnant and isolated vegetation.
Sicklepod	*Senna obtusifolia*	medium	Scattered in Julatten area. Agricultural pest.
Para Grass	*Brachiara mutica*	high	Widespread in wetlands & along non-vegetated river banks. Causes stream chokage, increased sedimentation & increased flood frequencies.
Black-eyed Susan	*Thunbergia alata*	low	Isolated occurence on Bushy Creek at Thunbergia site. Not a major problem but has weed history overseas
Navua Sedge	*Cyperus sp. ?*	high	Becoming more widespread in grazing areas of Julatten. Potential to outcompete Para Grass on creekbanks
Centro	*Centrosema pubesens*	medium	An escaped pasture plant for cattle fodder. Widespread in moister areas eg. Two Mile /Four Mile

			Creek. A vigorous legume forming "vine towers" on mature trees with potential to suffocate them.
African Tulip	*Spathodea campanulata*	low	Isolated occurrences as ornamental speciemens in yards. Has potential to spread, major problem in Hawaii & naturalised in the Darwin & Gove areas (NT) in monsoon vine forest (Swarbrick & Skarrat, 1994)

vegetation and habitat loss in Queensland (Sattler, 1993). Both these exotic vines act as harbourages for pest animals such as pigs which also have a large negative impact on the natural environment. A species of 'rust' was released in the early 1990s as a biological control for Rubber Vine in the upper part of the study area in the hope of limiting the weeds spread further downstream throughout the Gulf country. Ponded pastures have recently caused much debate within Queensland between DPI and cattle graziers, who are actively promoting species such as *Hymenachne amplexicaulis*, and conservationists who argue the high likelihood of monospecific wetlands of low biodiversity value (Csurhes & Edwards, 1998). Recent research (Bunn et al 1998) shows how debilitating an effect ponded pasture has on catchment health. Dense stands of these species act as sediment traps which lead to dramatic changes in stream hydrology and increased flood frequencies. Normal weathering processes, especially in granitic catchments, lead to sand deposition downstream (Woodfall et al., 1996). With land clearing adjacent to waterways, ideal conditions of high light intensity and increased water temperatures result in the growth of invasive macrophytes such as Para Grass and Hymenachne (Bunn et. al., 1998). These then trap further sediment and decrease the creeks channel capacity resulting in creeks breaking their banks during smaller flood events (Hogan & Vallance, 1997; Arthington et. al, 1992).

The eradication of Para Grass and Hymenachne, especially from waterways and the reinstatement of native riparian vegetation will assist in redefining the channel capacity and improve their functionality.

Guidelines for control of these and other weed species are provided in the accompanying Resource Folder.

7.0 Fauna

The study area has an extremly high fauna diversity because it contains two important 'priority' biogeographical regions that contain many rare and threatened species. These bioregions are the Wet Tropics and the Einasleigh Uplands In particular the Mt Carbine and Mt Windsor Tablelands are species rich with greater than 70% of the known endemic vertebrate species occurring in each.

Some 28% of Australia's total terrestrial vertebrate animals have been recorded in the wet tropics with at least 12% of these found only in the wet tropics (Williams, Pearson & Walsh; 1996). Invertebrates (insects, spiders, etc.) are also a very large and diverse group in the region, though poorly known with the exception of the butterflies. The diversity in vegetation with both closed and open forest communities, and the associated wildlife habitats they provide allows for a high number of all types of animals throughout the Upper Mitchell Catchment.

Most of the catchment has been poorly studied to date with the majority of recorded information focused on the Wet Tropics in the east. In addition, there are introduced animals, several of which have become serious pests. These include Wild Pigs, Feral Cats, Cane Toads, and exotic fish species such as *Tilapia*.

7.1 Mammals

The Wet Tropics has the highest number of endemic mammals (9) of any region in Australia. Seven of these occur in the wetter eastern regions of the Upper Mitchell catchment (listed in Appendix) Rainforest dwelling mammals considered important in the catchment include the **endangered** and declining endemic subspecies of the Tiger Quoll*, Dasyurus maculatus gracilis* and six other **rare** species. These include two species of tree Kangaroo, *Dendrolagus bennettianus* and *D. lumholtzi,* the Lemuroid, Daintree River and Green Ringtail Possums (*Hemibelideus lemuroides, Pseudochirulus cinereus and Pseudochirops archeri)* and the Thornton Peak Melomys, *Uromys hadeurus.*

Other animals in the Wet Tropics of the study area listed as **endangered** include the Fluffy Glider, *Petaurus australis reginae* and the Northern (Tropical) Bettong, *Bettongia tropica*. The Fluffy Glider inhabits wet sclerophyll forests on the westerly fringes of the wet tropics but the Northern Bettong is restricted to the westerly fringes of the Windsor and Carbine Tablelands No rare and/or threatened or endemic species have been recorded in the western outlying Bakers Blue Mountains although other widely distributed rainforest species do occur. This may be directly correlated to the lack of sampling in this remote area. Based on existing fauna records and climatic data it has been predicted that the rare Green Ringtail (*Pseudochirops archeri*) and Herbert River Ringtail (*Pseudochirops herbertensis)* possums may occur here although it is unlikely because of the ranges isolation and restricted rainforest area. Important species occurring in the westerly and drier areas of the Upper Mitchell Catchment include the **rare** Mareeba Rock Wallaby, *Petrogale mareeba*, an Einasleigh Upland endemic located around Mareeba and the Hann Tableland.

An additional ten mammal species present in the upper catchment have been listed by Williams et al (1996) as of particular importance to conservation and management (listed in the Appendix)

The study area has a suprisingly diverse bat fauna and received international recognition for it's importance in 1980 with the International Bat Research Conference being held in the region (Clague, 1998) The Tube-Nosed insectivorous bat, *Murina florium* – a relatively unknown and little recorded species - is commonly found in the upper Walsh River catchment area (Clague, 1998) and is listed as **vulnerable.** Richards (1983) described this species as the rarest mammal in Australia. Four other **rare** species found in the upper catchment include the Diadem Leaf-Nosed Bat, *Hipposideros diadema*, the Eastern Cave Bat *Vespadelus troughtoni*, the Ghost Bat, *Macroderma gigas* and the Large-eared Horseshoe Bat, *Rhinolophus philipinensis*. These are all cave roosting species and are found throughout the catchment.

7.2 Birds

The Upper Mitchell Catchment is very rich in avifauna. Nielsen (1996) states that Mt Molloy "is situated amidst what is probably the richest birding area in Australia" with nearly 300 species recorded within a 15km radius of the town. This includes all thirteen wet tropics endemics (listed in Appendix). The Mt Molloy environs represents an overlap zone of the Wet Tropics and drier Einasleigh Uplands bioregions and contains many diverse habitats from closed forest to lagoons and sclerophyll woodlands.

Two **endangered** species occur in the Upper Mitchell Catchment area. These are the Southern Cassowary, *Casuarius casuarius johnsonii*, and the Red Goshawk, *Erythrotriorchis radiatus*. The cassowary occurs in the wet tropics areas and are occasionally seen from time to time as they are moving between the Black Mountain Range and Mount Lewis. Locality records for the Red Goshawk are few and well scattered. They include the Julatten, Mt Molloy and Mt carbine areas (Nielsen, 1996).

In addition there are 9 bird species considered vulnerable and /or rare that have been recorded. Those listed as **vulnerable** include the Double-Eyed Fig Parrot, *Cyclopsitta diophthalma macleayi*, the Buff-breasted Button Quail, *Turnix olivei* and the Black-throated Finch*, Poephila cincta cincta* (southern subspecies*)*. The latter taxon is interesting because the MDIA to the south of the study area is believed to be an area of hybridisation for this subspecies with its northern (Cape York) counterpart (Garnett 1992).

Rare bird species that occur include the; Grey Goshawk, *Accipiter novaehollandiae*, White-Rumped Swiftlet, *Collocallia spodiopygius*, Blue-Faced Parrot Finch, *Erythrura trichroa*, the Black-necked Stork, *Ephippiorhynchus asiaticus,* the Square-tailed Kite *Lophoictinia isura* and the Black-chinned Honeyeater, *Melithreptus gularis.*

The **rare** Ground Cuckoo Shrike, *Coracina maxima,* is also predicted to occur in the drier regions of the Upper Mitchell River (Werren, 1995).

7.3 Reptiles

Over 70 species have been recorded for the Upper Mitchell River Catchment including both the wet tropical and the wet/dry monsoonal environments. The Carbine and Windsor Tablelands have been labelled as one of the areas of highest reptile diversity in the Wet Tropics Region (Williams et al, 1996). Of these the skinks have the largest recorded representation with a total of 33 species found in the study area. The only **rare** listing is for *Glaphyromorphus mjobergi,* found in the Carbine Uplands. A further five species of skinks are endemic to the wet tropics region only. These are the Northern Red-throated Skink, *Carlia rubrigularis*; the Prickly Forest Skink, *Tropidophorus queenslandiae*; Czechura's Litter Skink, *Lampropholis czechurai*; *Sphenomorphus tigrinus* and *S. mjobergi*. The distinctive Boyd's Forest Dragon, *Hypsilurus boydii,* and the Chameleon and Northern Leaf-tailed Geckoes (*Carphodactylus laevis and Saltuarius cornutus*) are other **endemic**s that occur in the rainforested areas of the upper catchment. In addition to these listings there are 12 species that are considered 'very important' (Williams et al, 1996) for conservation purposes (listed in Appendix).

The reptilian diversity of sclerophyll forests is generally lower than that found in rainforest communities although generally less is known about these drier habitats. The highest reptilian diversity for open forests is found in the Mareeba area and to the west of Mt Carbine (Covacevich and Couper,1994).

The Freshwater Crocodile, *Crocodylis johnstoni*, also occurs but is less common in the far upper catchment towards Mt Molloy.

7.4 Frogs

The Wet Tropics region contains the most diverse rainforest frog assemblage in Australia with the Mt Carbine uplands a core area of high rainforest frog diversity with a total of 21 species (Williams et al, 1996). This represents approximately two thirds of the total number of recorded species for the upper Mitchell River catchment. These high diversity areas are characterised by high rainfall, granite parent rock and high altitude.

The majority of rare and threatened species (including those that have been unsighted in recent years) occur in the upper sub-catchments of Bushy and Mary Creeks and the Walsh and McLeod Rivers. There are 6 **endangered** species of frogs in the study area. These are the Waterfall Frog, *Litoria nannotis*, the Common Mist Frog, *Litoria rheocola*, the Australian Lace-lid, *Nyctinystes dayi*, the Mountain Mist Frog, L*itoria nyakalensis*, the Sharp-snouted Torrent Frog, *Taudactylus acutirostrus* and the Northern Tinker Frog*, Taudactylus rheophilus*. Populations of the first 3 species have severely declined at altitudes greater than 300m and the latter 3 species

seem to have completely disappeared in despite being well protected by the WTWHA and intense survey work (Hero & Fickling, 1994).

In addition there are also 5 **rare** frog species and a further 14 of the Wet Tropic region's 20 rainforest **endemic** frog species found nowhere else (listed in the Appendix). Once again little recorded data is available for the western areas outside of the WTWHA.

7.5 Freshwater Fauna

The upper Mitchell River catchment supports at least 23 species of freshwater fish and the many billabongs and anabranches in the area (eg Mt Molloy lagoons) provide important migration and breeding areas for freshwater fauna. Recent surveys commissioned by the MRWMG in the upper Rifle Creek alone have recorded 15 species of freshwater fish. The fish assemblage in the study area also includes species that are more commonly found in the western flowing gulf rivers such as western forms of the Sooty Grunter, *Hephaestus feluginosus* and the Coal Grunter, *Hephaestus carbo* Trenerry, pers com).

No comprehensive documentation of freshwater fishes has been completed for this catchment outside of the wet tropics area. This includes the Mitchell River itself and the major sub-catchments of the Walsh and McLeod Rivers. The total of 23 species stated above is sure to be an underestimate.. The area is however well known locally, as being rich in fish fauna and the Mitchell River in particular is a popular recreational fishing area. Most sought after species and therefore those that experience the greatest fishing pressure include the Sooty Grunter, *Hephaestus feluginosus* and the Sleepy Cod, *Oxyeleotis lineolatus* . Invertebrates found in the Mitchell River that are also heavily fished include the Red Claw Crayfish, *Cherax quadricarenata* and the Giant Mitchell Prawn, *Macropragium rosenbergi*.

Three species of freshwater turtle are found in the study area. These are the Mitchell River Turtle, *Emydura tanybaraga*, the Northern Snapping Turtle, *Elseya dentata* and the Long-necked Turtle, *Cheledonia sp*. . An additional Striped-faced Turtle (*Elseya sp)*. and an *Emydura sp*. may also potentially occur although the taxonomic determination for these has not been resolved (Trenerry, pers com). Other freshwater fauna found in the study area includes Water Dragons, Water Skinks, frogs, the Platypus, *Ornithorhynchus anatinus,* the Long-Finned Eel, *Anguilla reinhardti* and the **rare** Mt Lewis Spiny Crayfish, *Euastacus fleckeri* .

In addition there are numerous freshwater crustaceans, molluscs, water spiders and insects that occur but are not dealt with in this report. Several introduced fish species also occur including various American livebearers (eg, Swordtails, & Guppies) and the Mozambique Tilapia, *Oeochromis mossabicus.*

7.6 Feral Animals

The Wild Pig is the most significant pest animal occurring in the area. The Wet Tropics Management Authority (1995) has identified feral pigs as one of the highest priority management concerns for the region. Feral Pigs are extremely abundant, have a wide distribution and cause large amounts of damage to the natural environment and agricultural productivity.

Feral cats are relatively common and have a large impact on ground-dwelling birds, reptiles, invertebrates, frogs and small to medium-sized mammals. Other pests occurring in the catchment, but of low priority are; feral dogs, the Cane Toad, the House Mouse, the Black Rat and four introduced bird species, including the Indian Mynah.

There have also been unconfirmed sightings of the fox in the Mt Carbine and Cape York Peninsula areas and it is very likely that they occur in the study area but sporadically or in extremely low numbers (Trenerry, pers. comm.).

Currently of concern in the Mitchell catchment is the possible spread of the exotic fish, Tilapia, *Oeochromis mossabicus*, from the Barron Catchment into the Mitchell system and on into the Gulf wetlands. Tilapia are a species of African fish which have been located in streams flowing into Tinaroo Dam and are reknown for their ability to successfully outcompete native fish species (Hogan & Vallance, 1997). It has been rumoured in the community that Tilapia already exist in the Collins Weir on the Walsh River but DPI staff have not been able to confirm this yet (Ryan,

pers. comm.). Other exotic fish species present that may pose a serious threat to native species are the livebearers such as Guppies and Swordtails. These will prey on small fish and eggs and have the potential to displace native species more so than Tilapia (Trenerry, pers com). A guideline for management and reduction of damage caused by pest animals is provided in the Resource Folder

7. 7 Destruction and Isolation of Animal Habitat

Habitat loss and the effect of external impacts such as weeds, feral animals, fire and roads have been major contributing factors to the declining populations of many of these animals.

Significant areas of vegetation have been cleared within the catchment, particularly on the rich alluvial soils of the Rifle and Bushy Creek floodplains. This has caused the loss of a large area of wildlife habitat and the isolation of remnant habitat areas scattered across the floodplain. Rehabilitation and management measures which can assist in the long-term survival of viable animal populations include the protection and enhancement of existing habitat in strategic locations, linking isolated patches of habitat through wildlife corridors and protection from direct threats (eg., predation by feral cats).

Important corridor areas have been identified on Map A(Figure 2) and projects to re-establish vegetation links in these corridors are a high priority for catchment rehabilitation. In addition, the development and implementation of Vegetation Management Guidelines will be valuable in long term management of remnant habitat throughout the catchment.

Watercourses and wetlands are also important as freshwater habitat, particularly for fish, waterbirds, frogs and invertebrates. The retention and reinstatement of vegetation in the floodplain areas and along waterways will assist in the maintenance of these important habitat areas.

8.0 Cultural Heritage

Cultural heritage places are those in the landscape which are considered important to the community or a section of the community because of their social, historical, aesthetic, architectural or archaeological value. Many such areas exist within the Upper Mitchell catchment. These are often associated with the early mining sites where European and Aboriginal cultures have violently clashed in the past.

8.1 Aboriginal Culture

Evidence suggests that Aboriginal occupation in the region has occurred for more than 40 000 years (Pedley 1992). Aboriginal inhabitation of the region was not passive and without influence (MRWMG 1996) with fire actively shaping the surrounding landscape (particularly in the woodland vegetation) and influencing the resource base on which the indigenous populations depended.

The major groupings of Aboriginal people in the study are include the Kuku-yalanji in the north and the Mbabaram in the south (Horton, 1994). The Kuku-yalanji can be further divided into two distinctive social groups. These are;

> Muluridji - in the central region around the Hann Tableland and the upper Mitchell River feeder creeks such as Two and Four Mile Creeks
>
> Kuku-Djungan – essentially about the Walsh River catchment to the north of Mbarbaram country.

The Mbarbaram were greatly effected from the 1870s by European settlement with the discovery of tin in the Herberton region. A series of ambushes of mines by the Aboriginal people – probably in response to destruction of Aboriginal food resources– led to the residents of Herberton petitioning the government to have the Aborigines driven from the district (Horton, 1994). The Kuku-yalanji in the far north of the upper catchment were similarly affected in the 1890s with the Palmer River gold rush. Many Aboriginal people were removed to missions during this period (Horton, 1994).

Within the landscape certain areas and places may be particularly significant sites.
Significant sites may include the grave sites of relatives, traditional camping grounds, story places, ceremonial grounds, mortuary sites, rockshelters and rock art .
As noted by DoE (1996a) in the *FNQ 2010 Draft Regional Environment Strategy,* the relationship of aboriginal people with their traditional country is a special one. For Aboriginal people the whole landscape has significance, and the distinction between cultural and natural places has little meaning. For this reason it is important that prior to any rehabilitation works being carried out in an area the respective Aboriginal communities should be consulted.

8.2 Non-Aboriginal Culture

The first systematic attempt at exploring the region occurred in 1873 with the Dalrymple Expedition. The discovery of gold in the Palmer River area to the north east of the study area coincided with the Dalrymple Expedition and was to be a catalyst for further settlement. Soon after the “gold diggers” moved into the area they were followed by other entrepreneurs who realised there were profits to be made from servicing the mining fields and cattle were brought in (MRWMG , 1996). Around this time more and more tin miners were emerging around Herberton in the most south-easterly part of the study area. Reports from Dalrymple’s expedition first publicised the fact that there was a potential timber resource in the area and from the mid-1870’s the assault began on the rainforests (Frawley, 1991). Land in the Mt Molloy/Julatten area was ‘open for selection’ in the early 1880’s and by 1931 had the second highest level of land clearing (2nd to Malanda) in the region (Swain, 1931). This area fell far short of expectations at the time and didn’t support productive agriculture as was anticipated with the degree of soil fertility being judged purely by vegetation cover and colour (Frawley, 1991).

Stock routes were also established in the late 1800s for the transport of stock and goods between the coast and the tableland areas including the Mitchell catchment and the settlement of Mareeba. The use of these routes continued until after the Second World War when the Rex Range road was developed (MRWMG, 1999). Community purpose reserves that are historically associated with the stock route include camping and water reserves that were established as rest and camping areas for graziers and travellers. One of these, the Blue Lagoon Reserve.
was the site of the former Cobb and Co Station and is defined as a historical site. There are many other unlisted sites throughout the study area associated with the mining period that are historically and culturally significant.

9.0 Landuse

Landuse in the Upper Mitchell catchment varies greatly across the region and includes intensive agriculture, cattle grazing, mining, tourism and recreation and the continual expansion of rural-residential developments. These appear to be developing in the Julatten area alongside with increased urban expansion in Mossman. The Mitchell River Watershed Management Group's (1996) study of the area identifies the most basic causes of land degradation as being the mismatch between land activities and land suitability.

Localised areas of the upper catchment were first settled in the 1870's following the discovery of gold in the Palmer, Hodgkinson and Upper Mitchell Rivers with further mining operations being established by the early 1900's in the Irvinebank area to the south. Land was 'opened up' for settlement in the Julatten and Mt Molloy areas, for dairying and agriculture, early this century following similar trends in the southern tableland areas (eg. Malanda). However by the 1930's the take up of land fell short of the Lands Department's expectations (Frawley 1991). It was not until the completion of Tinaroo Dam in the 1950's and the creation of the MDIA that landuse in the Mareeba/Dimbulah area rapidly increased (MRWMG 1996).
A small percentage of land in the northeast and southeast sections exists in reserves as State Forests and the WTWHA. These areas were severely logged prior to World Heritage listing in 1988 with a total volume of 273,259 cubic metres of virgin forest timber being permitted for extraction (mainly from Mt Windsor Tableland) over a five year period between 1981 and 1986 (Winter et. al. 1991).

9.1 Agriculture

Agriculture is the most intensive landuse in the study area and covers a total of 1,000 km^2 distributed across the Upper Walsh and Mitchell Rivers which represent the headwaters of the catchment (MRWMG 1996). For this reason agricultural development has the potential to greatly impact on the entire catchment. Agriculture is the main economic activity for the upper catchment with sugarcane rapidly becoming the dominant crop. Sugarcane expansion is rapidly expanding in the Julatten and MDIA despite concerns with land suitability, groundwater quality and sufficient quantities of water. Other significant agricultural crops in the MDIA, and Maryfarms to a lesser extent include; mangoes, avocadoes, lychees, tea-tree, tobacco and mixed vegetables.

Agricultural Best Practices

Rehabilitation considerations are applicable to landuses in the catchment because they benefit all community members within the region through improving catchment health and therefore allowing for increased productivity. Sustainable management practices have been developed for sugar cane farming, dairy and beef and general agriculture crops in the wet tropics by the DPI (Morris, Prove & Evans 1996a; 1996b; 1996d). These practices are recommended for implementation throughout the Upper Mitchell area and are aimed at;

- reducing soil losses by managing erosion through a coordinated run-off control program, minimising cultivation and maintaining a vegetative cover during the early stages of crop development;
- optimising nutrient management by appropriate placement of fertilisers, efficient fertiliser formulations and precise timing and rates of fertiliser applications and irrigation management;
- developing and implementing effective Integrated Pest Management (IPM) programs;
- introducing soil biodiversity through fallows, crop rotation and non-host covercrops; and
- allowing land unsuitable for agriculture to regenerate to its original state.

Specific recommendations relevant to rehabilitation include;

- revegetation of stream banks unsuitable for agriculture (including all major waterways);
- stabilisation of creek crossings to reduce erosion;
- increased use of fencing to control stock access;
- run-off control through utilising zero tillage and trash retention;
- utilisation of integrated pasture management strategies including the use of revegetation to reduce cane rodent habitat; and,
- use of appropriate pesticides and correct disposal of pesticide containers.

In addition, several broad management approaches have been recommended for the high salinity prone areas within the MDIA (SalCon, 1995) to prevent further degradation of the groundwater quality. These practices aim to reduce the amount of recharge into the groundwater by;

- maintaining existing vegetation cover to reduce excess water percolation below the root zone;
- avoiding excess irrigation and summer fallow of crops (high rainfall period);
- constructing drains to dispose of excess runoff either by evaporation or reuse on farms;
- strategic revegetation in areas where trees can access the groundwater; and,
- groundwater interception at the transmission area.

The best way to implement these practices is to retain areas of remnant native vegetation where possible and re-establish corridors of vegetation through the agricultural landscape, particularly along watercourses including those modified to cane drains.

9.2 Grazing

Grazing occurs in all areas outside of the above-mentioned agricultural centres with properties tending to be large with the application of low intensity management. Much of the country in the Upper Mitchell Catchment which supports grazing is nutrient poor thus the importance and value of the highly fertile creek banks is greatly increased. Grazing pressure can result in the loss of vegetation (especially groudcover), compaction, stream bank erosion, high nutrient and sediment inputs to streams and the introduction and spread of weeds (Sattler 1993). The importance of the riparian zone for land uses such as grazing dictates that carefully planned measures are needed to manage these areas in a sustainable fashion.

Sattler (1993) documents a successful property management strategy in the Victoria River District of Northern Territory. The Heytesbury Pastoral Group fenced 250km of the Victoria River to exclude cattle, up to 1km from the river in some places to extend beyond gully heads. Off-stream watering was provided for the stock. Although initially expensive the company states that the exercise was 'cost neutral'. Savings were made because; there was no need for regular checking of the river for stock, expensive helicopter musterings were reduced, and no more cattle were getting bogged. This management not only provided effective protection for the riparian zone but during drought periods it is used for relief grazing for short time periods.

9.3 Mining

Mining is documented as the oldest non-aboriginal landuse in the catchment (MRWMG 1996) with the greatest density of mines in the Mitchell River watershed being in the eastern upland headwaters of the Walsh and Mitchell River catchments (Bartareau et al 1998). One open cut mine exists in the study area, Mount Carbine (but is no longer functional), and an alluvial tin mine is currently operating in Leichardt Creek at the foothills of the western fall of Mt Lewis.

Mining operations have drastically changed over the last 100 years with all mines now being required to implement Environmental Management Overview Strategies (EMOS) which require details on the mine lifetime and site rehabilitation strategies. During previous there have been

discharges of, AMD (acid mine discharge), tailings and waste rock from many abandoned mines into adjacent streams (Bartareau 1998) .To date little water quality testing has been performed in these areas. Most potential contamination is thought to originate from derelict mine sites that were abandoned prior to the introduction of the *Mineral Resources Act* 1989 with the highest concentration of these sites occurring in the southern region of the Upper Mitchell Catchment around the Herberton-Irvinebank area. It is estimated that approximately one site occurs every 15km^2 (MRWMG 1996).

9.4 Tourism and Recreation

Tourism is rapidly on the rise with the Mitchell 'area' providing the closest "outback" experience to Cairns. Due to the northern catchment's zone of biogeographical overlap visitors can experience elements of Cape York Peninsula, lowland and upland rainforest communities, various wetlands and the associated high level of wildlife diversity without travelling large distances. Popular activities include fishing, camping, four-wheel driving, rainforest walks, birdwatching and canoeing. The access provided by four wheel drives to previously inaccessible areas has created a difficult to manage recreational use with associated problems including fires, rubbish, weed spread and site impacts which are often associated with riparian areas.

10.0 Local Issues of Concern affecting Catchment Management

Many issues associated with land/resource security and the rights of landholders to make land management decisions on their property have caused anxiety. These concerns affect the potential for carrying out rehabilitation works in the catchment through creating uncertainty about future land management rights over areas rehabilitated using public funds. In order for rehabilitation to proceed effectively, these issues need to be considered in project selection and planning. Issues relevant to the Upper Mitchell Catchment are outlined below.

10.1 Riparian Vegetation Zone Widths

This is perhaps the most sensitive of the concerns currently affecting rehabilitation works within the region as a whole. Landholders are concerned that they will effectively lose their rights to decide what happens to land and resources (eg. tree crops) which fall within the riparian zone. The *Water Resources Amendment Act* 1993 provides protection to all vegetation lying within the high banks of a waterway. Any works that will disturb this vegetation require a permit from DNR (Water Resources). In addition the RIT can issue River Improvement Notices to protect riparian vegetation for 20m either side of a waterway. Notices can prohibit removal of riparian vegetation if the RIT considers that this would be detrimental to the functioning of the river system in floods or cyclones. Notices may require the re-establishment of riparian vegetation in an area which has been cleared previously. The Notices are recorded on the instrument of title and are binding on subsequent occupiers of the land (ID&A 1996).

Recommendations for riparian zone protection should take into account the condition of the stream on a site-specific basis. This includes assessing the erosion hazard, stream size and riverbank erosion processes. Rehabilitation works undertaken by the WTTPS will have no prescribed widths for riparian vegetation establishment or protection. Contributions of lands for revegetation and other works will be on a voluntary basis only and all landholder contributions to rehabilitating riparian areas, no matter the width of the area contributed, will be of value to improving the overall health of the catchment.

10.2 Security of "Re-established" Vegetation

There has been some discussion with regard to 'security' of plantings in government-funded tree planting schemes such as the WTTPS. The WTTPS has operated on a basis of establishing trust between the landholder and the Scheme. This has been effective in promoting landholder interest in participating in rehabilitative tree planting projects. For any commercial resources established during rehabilitation works carried out under this plan, it is recognised that **full ownership of these resources is vested in the landholder** unless conditions agreed on by the landholder and any other party involved are established prior to the commencement of the work.

10.3 Tree Clearing Controls

The Queensland Government has established tree-clearing guidelines for all areas of public land within the State, including State Land under lease for agriculture or other purposes. When new leases are issued or leases come up for renewal conditions on tree clearing can be included. Where clearing is restricted, permits are available for tree removal associated with property improvements such as establishing new fencelines, water facilities or structural improvements and these permits are evaluated on a case-by-case basis by the Wet Tropics Tree Clearing Advisory Group (WTTCAG 1996). The advisory group consists of State Government Employees and members of the general public in each designated biophysical unit in the State.

Landholders are encouraged, because of productivity benefits to the individual and to the general public through a healthy and productive catchment, to retain as much natural vegetation as possible, particularly in sensitive habitat corridors, areas susceptible to erosion and salinity and along waterways.

10.4 Overland Water Flows, Flooding and Unstable River Channels

Reduction in overland water flows and flood impacts, and improving water yields (base flows) are criteria used in the catchment rehabilitation priorities assessment method in this report and can be partly addressed through revegetation. Retention/reestablishment of riparian vegetation, especially on tributaries in the headwaters of catchments, assists in reducing overland and in-stream water volumes and stabilising channels (preferred flow paths).

Although fully addressing flood management is outside the scope of this report, rehabilitation efforts can compliment other flood management works in various ways. It has been demonstrated that trees and other vegetation provide a natural barrier to overland waterflows. Well-placed plantings can therefore be used to restrict overflow from flooding rivers. An additional effect is to slow drainage across the catchment, thereby spreading out the water volume. This has two positive benefits; firstly it reduces the peak levels of water flow (including floods) and secondly, it improves overall water yield for the catchment. Bank stabilisation and the filtering capacity of riparian vegetation also helps to reduce erosion and sedimentation which cause stream blockage, chokage by Para Grass and increased flood peaks and frequencies.

10.5 Stock Access to Streams

Graziers have traditionally used streams for watering stock and the nutrient rich stream banks provide lush grasses for foraging. These areas become especially valuable in the dry monsoon tropics towards the latter end of the 'dry season' when cattle fodder and water often become scarce. Stock access to streams is frequently associated with riparian degradation and bank erosion. These conflicts create problems particularly with respect to the maintenance of stock access to water and the repair of degraded riparian communities.

Where riparian rehabilitation works are proposed on private grazing land with unrestricted stream

access it is necessary to negotiate alternative arrangements with the landholder to protect the plantings from browsing and mechanical damage by trampling. Alternative measures may include fencing off the riparian zone with provision of offstream watering points or restricted stock access.

10.6 Pest Management

Pest control activities need to be coordinated throughout the region to ensure effective eradication of pest plants and animals. Pest management is generally designated the responsibility of the landholder. For declared pests, landholders are required to control any occurrence on their land; this applies to both publicly and privately managed lands. There is a degree of concern in the region that some agencies are shirking their responsibility of controlling pests on publicly managed lands, and these areas provide a source for re-invasion of pests to adjacent areas. This applies to waterways as well. The current threat of *Tilapia* moving from the east flowing creek systems into the west flowing catchments and on into the Gulf could present a major problem for fishing industries in the Gulf of Carpentaria. This highlights the need for coordinated activities across all agency levels.The Mareeba Shire Council has recently reviewed the on-ground progress of it's *Pest Management Plan* 1997 which is particularly important in addressing Thunbergia, Rubber Vine, Hymenachne and Parthenium weed. It is important that adequate funding is provided from land management agencies within the Shire to continue implementing the plan effectively.

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APPENDIX I
Criteria for Assessment of Catchment Rehabilitation Priorities

APPENDIX 1I

Species Lists for Revegetation within the Upper Mitchell Catchment

Note: These lists are provided as an indication only of the most common species for each broad environment listed below.

ENVIRONMNETAL SITE GROUPS

1 Sclerophyll Forest – a) riparian areas
- b) low to medium woodland

2 H igh Rainfall/closed forest areas
('Main Focus' of study area, ie Julatten/Mt Molloy area)
= Group 6 (Tucker & Goosem)

1. SCLEROPHYLL FOREST

a) Riparian areas

Botanical Name	**Standard Common Name**
Barringtonia acutangula ssp acutangula	FRESHWATER MANGROVE
Bursaria tenuifolia	SWEET BLACKTHORN
Canarium australianum	MANGOBARK
Casuarina cunninghamiana	RIVER OAK
Eucalyptus tereticornis	FOREST BLUE GUM
Eucalyptus tessellaris	CARBEEN
Ficus opposita	SANDPAPER FIG
Garcinia warrenii	NATIVE MANGOSTEEN
Lomandra longifolia	MATRUSH
Lophostemon grandiflorus ssp riparius	NORTHERN SWAMP BOX
Melaleuca leucadendra	PAPERBARK
Nauclea orientalis	LEICHHARDT TREE
Planchonia careya	COCKY APPLE
Pongamia sp. (BH3295)	PONGAMIA
Randia fitzalani	BROWN GARDENIA
Syzygium tierneyanum	RIVER CHERRY
Terminalia platyphylla	WILD PLUM

b) Low to medium woodland

Botanical Name	**Standard Common Name**
Acacia flavescens	RED WATTLE
Alocasuarina leuhmannii	BULL OAK
Alocasuarina littoralis	FOREST OAK
Coelospermum reticulatum	no common name
Eucalyptus acmenoides	YELLOW STRINGYBARK
Eucalyptus crebra	IRONBARK
Eucalyptus leptophleba	MOLLOY BOX
Eucalyptus platyphylla	POPLAR GUM
Eucalyptus tereticornis	FOREST BLUE GUM
Eucalyptus tessellaris	CARBEEN

Grevillea coriacea	no common name
Grevillea glauca	BUSHMANS CLOTHESPEGS
Grevillea paralella	no common name
Grevillea pteridifolia	GOLDEN GREVILLEA
Hakea persiehana	HAKEA
Lophostemon suaveolens	SWAMP MAHOGANY
Melaleuca minutifolia	BLACK TEA-TREE
Melaleuca nervosa	no common name
Melaleuca viridiflora	BROAD-LEAVED TEA-TREE
Pandanus sp.	PANDANUS
Persoonia falcata	GEEBUNG
Petalostigma banksi	QUININE
Santalum lanceolatum	SANDALWOOD

2. HIGH RAINFALL/CLOSED FOREST – Group 6

Moist uplands, metamorphic – granite

Botanical Name	Standard Common Name
Acronychia acidula	LEMON ASPEN
Agathis robusta	QUEENSLAND KAURI
Aleurites rockinghamensis	CANDLENUT
Alphitonia petriei	PINK ASH
Alphitonia whitei	RED ASH
Antidesma erostre	CURRANTWOOD
Archidendron hendersonii	TULIP SIRIS
Archirhodomyrtus beckleri	PINK MYRTLE
Arytera divaricata	ROSE TAMARIND
Arytera lautereriana	CORDUROY TAMARIND
Austromyrtus dallachiana	LIGNUM
Beilschmedia obtusifolia	BLUSH WALNUT
Blepharocarya involucrigera	ROSE BUTTERNUT
Brachychiton acerifolius	FLAME TREE
Buckinghamia celsissima	SPOTTED SILKY OAK
Cardwellia sublimis	NORTHERN SILKY OAK
Carnarvonia araliifolia	CALEDONIAN OAK
Castanospermum australe	BLACK BEAN
Cryptocarya corrugata	CORDUROY LAUREL
Chionanthus ramiflorus	NORTHERN OLIVE
Cryptocarya hypospodia	NORTHERN LAUREL
Cryptocarya mackinnoniana	RUSTY LAUREL
Cryptocarya triplinervis	BROWN LAUREL
Darlingia darlingiana	BROWN SILKY OAK
Davidsonia pruriens	DAVIDSONS PLUM
Decaspermum humile	BROWN MYRTLE
Diospyros cupulosa	EBONY
Diospyros hebecarpa	SCRUB EBONY
Diospyros pentamera	GREY PERSIMMON
Dysoxylum pettigrewianum	SPUR MAHOGANY
Elaeocarpus angustifolius	SILVER QUANDONG
Elaeocarpus bancroftii	KURANDA QUANDONG
Elaeocarpus largiflorens ssp largiflorens	TROPICAL QUANDONG
Elaeocarpus ruminatus	BROWN QUANDONG
Endiandra hypotephra	ROSE WALNUT
Endiandra sankeyana	SANKEY'S WALNUT
Evodiella muelleri	PINK EVODIA
Euodia bonwickii	YELLOW EVODIA
Euroschinus falcata ssp falcata	PINK POPLAR
Ficus benjamina	WEEPING FIG
Ficus destruens	RUSTY FIG
Ficus obliqua var obliqua	FIGWOOD
Ficus racemosa	FIGWOOD
Ficus superba	SUPERB FIG
Ficus virens	FIGWOOD
Ficus watkinsiana	WATKIN'S FIG

Flindersia bourjotiana	QUEENSLAND SILVER ASH

Botanical Name	**Standard Common Name**
Flindersia pimenteliana	MAPLE SILKWOOD
Flindersia schottiana	SILVER ASH
Galbulimima belgraveana	MAGNOLIA
Glochidion benthamianum	Pin-flower Tree
Glochidion harveyanum	BUTTONWOOD
Glochidion philippicum	DAINTREE CHEESE TREE
Glochidion sumatranum	BUTTONWOOD
Gmelina dalrympleana	WHITE BEECH
Gmelina fasciculiflora	WHITE BEECH
Grevillea baileyana	FINDLAY'S SILKY OAK
Grevillea hilliana	HILL'S SILKY OAK
Guioa acutifolia	GLOSSY TAMARIND
Guioa lasioneura	SILKY TAMARIND
Harpullia pendula	TULIPWOOD
Helicia nortoniana	NORTON'S SILKY OAK
Homalium circumpinnatum	BROWN BOXWOOD
Litsea bindoniana	BIG LEAF BOLLYWOOD
Litsea connorsii	BOLLYWOOD
Litsea leefeana	BROWN BOLLYWOOD
Mallotus philippensis	RED KAMALA
Melia azederach	WHITE CEDAR
Melicope elleryana	PINK EVODIA
Mischocarpus exangulatus	BELL-FRUIT TREE
Mischocarpus lachnocarpus	WOOLLY PEAR FRUIT
Mischocarpus pyriformis	TAMARIND
Myristica insipida	NUTMEG
Nauclea orientalis	LEICHHARDT TREE
Neolitsea dealbata	GREY BOLLYWOOD
Omalanthus novo-guineensis	BLEEDING HEART
Opistheolepis heterophylla	BLUSH SILKY OAK
Paraserianthes toona	MACKAY CEDAR
Phaleria clerodendron	SCRUB DAPHNE
Pittosporum ferrugineum	RUSTY PITTOSPORUM
Planchonella obovoidea	YELLOW BOXWOOD
Podocarpus grayae	BROWN PINE
Prumnopitys amara	BLACK PINE
Prunus turneriana	ALMONDBARK
Pullea stutzeri	HARD ALDER
Rhysotoechia robertsonii	ROBERT'S TUCKEROO
Scolopia braunii	BROWN BIRCH
Sloanea langii	WHITE CARABEEN
Symplocos cochinchinensis ssp. thwaitesii var. stawelli	WHITE HAZELWOOD
Syzygium cormiflorum	BUMPY SATINASH
Syzygium endophloium	BARK IN THE WOOD
Syzygium johnsonii	ROSE SATINASH
Syzygium kuranda	KURANDA SATINASH
Syzygium leuhmannii	CHERRY SATINASH
Syzygium papyraceum	PAPERBARK SATINASH
Syzygium tierneyanum	RIVER CHERRY
Terminalia sericocarpa	DAMSON

Ternstroemia cherryi	CHERRY BEECH
Xanthostemon whitei	RED PENDA

APPENDIX III - Fauna Lists for Upper Mitchell Catchment

Terrestrial Mammal Species of the Upper Mitchell Catchment

E = endangered, R = rare, V = vulnerable, e = endemic,
C = 'important species' for conservation

(list complied from; Williams et al,1996; Clague 1998; Winter - personal database; Burnett, pers comm. & Trenerry, pers comm.)

Scientific Name	Common Name	Status
Monotremes		
Ornithorhynchus anatinus	Platypus	
Tachyglossus aculeatus	Short-beaked Echidna	
Mammals		
Acrobates pygaeus	Feathertail Glider	
Aepyprymnus rufescens	Rufous Bettong	c
Bettongia tropica	Northern Bettong	E
Cercartetus caudatus	Long-tailed Pigmy Possum	e
Dactylopsila trivirgata	Striped possum	
Dasyurus hallucatus	Northern Quoll	
Dasyurus maculatus gracilis	Tiger Quoll	E
Dendrolagus bennettianus	Bennett's tree-kangaroo	R, e
Dendrolagus lumholtzi	Lumholtz's Tree-kangaroo	R, e
Eapyprymnus rufescens	Rufous Bettong	
Hemibelideus lemuroides	Lemuroid Ringtail Possum	R, e
Hypsiprymnoden moschatus	Musky rat-kangaroo	e
Isoodon macrourus	Northern Brown Bandicoot	
Macropus agilis	Agile Wallaby	
Macropus giganteus	Eastern Grey Kangaroo	
Macropus parryi	Whiptail Wallaby	
Macropus robustus	Common Wallaroo	
Perameles nasuta	Long-nosed bandicoot	
Petauroides volans	Greater Glider	c
Petaurus australis reginae	Yellow-bellied glider	E
Petaurus breviceps	Sugar Glider	
Petaurus norfolcensis	Squirrel Glider	c
Petrogale mareeba	Mareeba rock Wallaby	R
Pseudocheirus cinereus	Daintree River Ringtail	R, e
Pseudocheirus peregrinus	Common Ringtail Possum	
Pseudochirops archeri	Green Ringtail possum	R, e
Thylogale stigmatica	Red-legged Pademelon	
Trichosurus vulpecula	Common Brushtail Possum	
Wallabia bicolor	Swamp Wallaby	
Phascogale tapoatafa	Brush-tailed Phascogale	
Sminthopsis murina	Common Dunnart	
Petrogale godmani	Godman's Rock Wallaby	c
Rodents		
Antechinus flavipes	Yellow-footed Antechinus	
Antechinus stuartii	Brown Antechinus	
Hydromys chrysogaster	Water Rat	

Scientific Name	Common Name	Status
Melomys burtoni	Grassland Melomys	
Melomys cervinipes	Fawn-footed Melomys	
Uromys hadrourus	Thornton Peak Melomys	R, e
Mesembriomys gouldi	Black-footed Tree Rat	
Pogonomys mollipilosus	Prehensile-tailed rat	c
Pseudomys delicatulus	Delicate Mouse	
Pseudomys gracilicaudatus	Eastern Chestnut native Mouse	
Rattus fuscipes	Bush Rat	
Rattus fuscipes/leucopus	Bush rat/Cape York rat	
Rattus leucopus	Cape York Rat	
Rattus sordidus	Canefield rat	
Uromys caudimaculatus	White-tailed rat	
Bats		
Chaerephon jobensis	Northern Freetail bat	
Chalinolobus nigrogriseus	Hoary Wattled bat	
Eptesicus pumilis	Eastern cave bat	
Eptesicus pumilis	Eastern cave Bat	
Hipposideros ater	Dusky Leafnosed Bat	
Hipposideros diadema	Diadem Leafnosed Bat	R
Kerivoula troughtoni	Eastern Cave Bat	R
Macroderma gigas	Ghost Bat	R
Macroglossus minimus	Northern Blossum Bat	
Miniopteris schreibersii	Common Bentwing Bat	
Miniopterus australis	Little Bentwing Bat	
Mormopterus beccarii	Becarri's Freetail bat	
Mormopterus loriae	Little Northern Freetail Bat	
Murina florium	Tube-nosed Insect Bat	V, e
Myotis macropus	Large footed Myotis	
Myotus advertus	Large-footed Mouse-eared Bat	
Nyctimene robinsoni	Queensland Tube-nosed Bat	
Nyctophilus bifax	eastern Long-eared bat	
Pipistrellus adamsi	Cape York Pipistrelle	
Pteropus alecto	Black Fruit Bat	
Pteropus conspicillatus	Spectacled Flying Fox	
Pteropus scapulatus	Little red fruit bat	
Pteropus scapulatus	Little red Flying Fox	
Rhinolophus megaphyllus	Eastern Horseshoe bat	
Rhinolophus megaphyllus	Eastern Horsheshoe bat	
Rhinolophus phillipinensis	Large-eared Horseshoe Bat	R
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	
Scoteanax rueppellii	Greater Broad-nosed bat	
Syconycteris australis	Common Blossum Bat	
Tadarida australis	White-Striped Freetail Bat	
Taphozous georgianus	Common Sheathtail Bat	
Vsepadelus pumilus	Eastern Forest Bat	
Scotorepens balstoni	Inland Broad-nosed Bat	

Reptile Species of the Upper Mitchell Catchment

E = endangered, R = rare, V = vulnerable, e = endemic,
C = 'important species' for conservation

(list complied from; Williams et al,1996; Winter - personal database; Burnett, pers comm. & Trenerry, pers comm.)
* = taxonomic determination for these spp is unresolved

Scientific Name	Common Name	Status
Snakes		
Acanthophis praelongis	Northern Death Adder	
Aspidites melanocephalus	Black-headed Python	
Boiga irregularis	Brown tree Snake	
Cacophis churchilli	Golden Crowned Snake	c
Demansia psammophis	Yellow-faced Whip Snake	
Dendrolophis calligastra	Northern Tree Snake	
Dendrolophis punctulata	Common Tree Snake	
Enhydris polyplepis	McLeay's Water Snake	
Furina ornata	Orange-naped snake	
Hemiaspis signata	Black-bellied Swamp Snake	
Hoplocephalus bitorquata	Pale-headed Snake	
Liasis maculosus	Spotted python	
Mirelia spilota	Carpet python	
Morelia amethestina	Amethystine Python	
Morelia spilota	Carpet Python	
Oxyuranus scutellatus	Taipan	
Pseudechis australia	King Brown Snake	
Pseudechis porphryriacus	Red-bellied Black Snake	
Pseudonaja textilis	Eastern Brown Snake	
Rhinoplocephalus nigrescens	Eastern Smalleyed Snake	
Rhinoplocephalus nigrostriatus	Black-striped Snake	
Stegonotus cucullatus	Slaty-grey Snake	
Tropidechis carinatus	Rough-scale Snake	
Tropidonophis mairii	Freshwater Snake/Keelback	
Vermicella annulata	Bandy Bandy	c
Dragons		
Amphibolurus barbatus	Bearded Dragon	
Amphibolurus nobbi	Nobbi	
Chlamydosaurus kingii	Frilled Lizard	
Diporiphira australis		
Diporiphira bilineata	Two-lined Dragon	
Hypsilurus boydii	Boyd's Forest Dragon	e
Physignathus lesuerii	Eastern Water dragon	
Monitors		
Varanus scalaris		
Varanus varius	Lace Monitor	
Skinks		
Carlia jarnoldae		
Carlia munda		

Scientific Name	Common Name	Status
Carlia pectoralis		
Carlia rostratus		
Carlia rubrigularis	Northern Red-throated Skink	c
Carlia schmeltzii		
Carlia storri		
Carlia vivax		
Coeranoscincus frontalis		c
Cryptoblepharus plagiocephal		
Cryptoblepharus virgatus		
Ctenotus terrareginae		c
Egernia hosmeri	Hosmer's Prickly Skink	
Ergenia frerei	Major Skink	
Eulamprus brachysoma		
Eulamprus tennis		
Eulamprus tigrinus		c
Glaphyromorphus crassicaudus		
Glaphyromorphus fuscicaudis	Grey-tailed Skink	c
Glaphyromorphus nigricaudis		
Glaphyromorphis mjobergi		R
Glaphyromorphus pardalis		
Gnypetoscincus queenslandiae	Prickly Forest Skink	c
Lampropholis coggeri		c
Lampropholis robertsi		c
Lerista zonulata		c
Lialis burtonis	Burton's Legless Lizard	
Lygisaurus aeratus		
Lygisaurus foliorum		
Menetia greyii		
Morethia taeniopleura	Fire-tailed Skink	
Saproscincus basiliscus		c
Saproscincus czechurai	Czechura's Litter Skink	c
Saproscincus tetradactyla	Four-toed Litter Skink	c
Geckoes		
Cyrtodactylus louisadensis	Ringtail Gecko	
Gehyra dubia	Dubious Dtella	
Heteronotia binoei	Binoe's Gecko	
Nactus chevertii	Pelagic gecko	
Oedura coggeri	Northern Velvet Gecko	
Oedura rhombifer	Zig-Zag gecko	
Diplodactylus steindachneri		
Carphodactylus laevis	Chameleon Gecko	e
Saltuarius cornutus	Northern Leaf-tail Gecko	e
Turtles/Tortoises		
Emydura tanybaraga	Mitchell Turtle/Nthn Yellow Faced	
Elseya dentata	Northern Snapping Turtle	
Chelodina sp (syn. C. novaeguineae) *	Long-necked Turtle	
Elseya sp. *	Striped-faced Turtles	
Emydura kreftii *	Krefft's River Tortoise	
Crocydylus johnstoni	Freshwater Crocodile	

Amphibian Species of the Upper Mitchell Catchment

E = endangered, R = rare, V = vulnerable, e = endemic,
C = 'important species' for conservation

(list complied from; Williams et al,1996; Hero & Fickling 1994)

Scientific Name	Common Name	Status
Frogs		
Cophixalis bombiens	Windsor Buzzing frog	R, e
Cophixalis concinnus	Slow Rattling Frog	R, e
Cophixalis hosmeri	Fast Rattling frog	R, e
Cophixalis monticola		c
Cophixalis ornatus	Ornate Litter Frog	e
Limnodynastes peronii	Striped Marsh Frog	
Litoria alboguttata	Greenstripe Frog	
Litoria bicolor	Northern Sedge Frog	
Litoria caerulea	Green Tree Frog	
Litoria fallax	Eastern Sedge frog	
Litoria genimaculata	Gree-eyed tree Frog	R
Litoria gracilenta	Graceful Treefrog	
Litoria inermis	Bumpy Rocket Frog	
Litoria infrafrenata	White-lipped Tree Frog	
Litoria latopalmata	Broad-palmed Rocket Frog	
Litoria leseuri	Stong Creek Frog	
Litoria nannotis	Waterfall Frog	E, e
Litoria nasuta	Striped Rocket Frog	
Litoria nigrfrenata		
Litoria nyakalensis	Mountain Mist Frog	E/ex, e
Litoria rheocola	Common Mist frog	E, e
Litoria rothi	Red-eyed tree Frog	
Litoria rubella	Naked Tree Frog	
Litoria xanthomera	Northern Orange-eyed Tree Frog	e
Mixophyes schevilli	Northern Barred frog	e
Nyctimystes dayi	Australian Lace-lid	E, e
Rana daemeli	Australian Bullfrog	
Sphenophryne fryi	Fry's Whistling Frog	R, e
Sphenophryne pluvialis	Rain Whistling Frog	e
Taudactylus acutirostris	Sharp-snouted torrent Frog	E/ex ?, e
Taudactylus rheophilus	Northern Tinker Frog	E/ex?, e
Uperoleia altissima	Tableland Gungan	c
Uperoleia lithomoda	Stonemason Gungan	
Uperoleia mimula	Torres Gungan	

Freshwater Fauna of the Upper Mitchell Catchment

E = endangered, R = rare, V = vulnerable, e = endemic,
C = 'important species' for conservation

(Herbert & Peeters 1995, with significant input from Trenerry, pers comm)

Scientific Name	Common Name	Status
Fishes		
Ambassis sp.	Reticulated Perchlet	
Amniataba percoides	Banded Grunter	
Anguilla reinhardti	Long-finned Eel	
Craterocephalus stercusmuscarum	Flyspecked hardyhead	
Gambusia spp	Mosquitofish	exotic
Glossamia aprion	Mouth Almighty	
Glossogobius ssp + various genera	Gobies	
Hephaestus carbo	Coal Grunter	
Hephaestus fuliginosus	Sooty Grunter	
Hypseleotris compressa	Empire Gudgeon	
Hypseleotris gallii	Firetail Gudgeon	
Leiopotherapon unicolor	Spangled Perch	
Melanotoenia inornata	Checkered Rainbowfish	
Mogurnda mogurnda	Trout Gudgeon	
Nematolosa erebi /come	Freshwater Herring/Bony Bream	
Neosilurus ater	Black Catfish	
Neosilurus glencoensis	Glencoe Catfish	
Neosilurus rendahl	Rendahl Gudgeon	
Neosilurus spp.	Little Eel-tailed catfish	
Oeochromis mossabicus	Mozambique Tilapia	exotic
Oxyeleotis lineolatus	Sleepy Cod	
Oxyeleotris archensis	Aru Gudgeon	
Poecila spp	Guppies	exotic
Selheinismis sp.	Freshwater Sole	
Tandanus tandanus	Big Eel-tailed Catfish/Jewfish	
Toxotes chatareus	Archer Fish	
Xipophorus spp	Platy/Swordtails	exotic
Invertebrates		
Cherax quadricarenata	Red Claw Crayfish	
Cherax depressus	Smooth Crayfish	
Euastacus fleckeri	Mt Lewis Spiny Crayfish	R, e
Macropragium rosenbergi	Mitchell Giant prawn	e