

Chairman

This management document will assist in the development and enforcement of procedures that fulfil Council's statutory obligations under the *Crown Lands Act 1989*, and ecologically sustainable awareness and development for the Gwydir Shire Council and its residents.

CONCLUSION

It is proposed to exhibit the plan and seek community comment prior to the Plan's formal adoption with any alterations considered appropriate..

CONSULTATION

There has been discussion with stakeholder groups and also an early draft has been circulated to the elected members for comment. Please note that since the last draft was forwarded a change has been included that allows a maximum of 14 day camping outside the designated Bingara town boundary.

STATUTORY ENVIRONMENT

As the Reserve Trustee the Council is required to develop a Plan of Management.

FINANCIAL IMPLICATIONS

The plan does have the potential to include expenditure allocations into the future but these allocations will be subject to the Council's normal budgetary considerations.

STRATEGIC IMPLICATIONS N/A

OFFICER RECOMMENDATION

THAT the draft Gwydir River Crown Land Reserves Plan of Management be placed on public exhibition for a period of 40 days seeking public comment on the draft Plan of Management.

ATTACHMENTS

AT- Draft Plan

AT- Flora, Vegetation and Management Considerations: Gwydir River - Bingara. Dr J. T. Hunter

COMMITTEE RECOMMENDATION TO COUNCIL:

THAT the draft Gwydir River Crown Land Reserves Plan of Management be placed on public exhibition for a period of 40 days seeking public comment on the draft Plan of Management after the approval of the Lands Office is received with an alteration to Page 26 Recommendation regarding camping should read:

- Install signage restricting camping to a maximum of 7 continuous days at all sites within the Bingara designated town boundary and monitor/enforce
- Install signage restricting camping to a maximum of 14 continuous days at all sites outside the Bingara designated town boundary and monitor/enforce
- Introduce a 'no go' rotation of sites to be 'rested' to allow for rehabilitation
- Install signage and maintain the current event only camping area that limits access and allow exclusive **camping** access to the Boat Ramp section by the Bingara Anglers' Club and monitor/enforce **noting that access to the boat ramp facility is available to all members of the public.**
- Review the need to have a camping fee in June 2018 following the suggested capital improvements
- Continue discussions with CMCA regarding a possible partnering arrangement

FURTHER that members of the public be requested to specifically note and comment on the proposed locations of the public toilets when considering the draft Plan of Management.

(Moved Cr Egan, seconded Cr Young)

Gwydir River Crown Land Reserves
Plan of Management



Prepared By:
The Gwydir Shire Council
Development & Environmental Services
January 2017

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**Dr J Hunter, 'Management Issues: Public Usage' in Flora, Vegetation & Management
Considerations: Gwydir River – Bingara, 2013**

Executive Summary

Vision

To provide a network of sustainable riverside reserves that support camping and day use recreation, for the enjoyment of future generations

The aim of the management plan is to enable the Gwydir Shire Council to protect, enhance and conserve, the natural, cultural, social and built features, of the Crown Land Reserves situated along the Gwydir River, whilst enhancing and encouraging community and visitor use. The implementation of the management plan will allow for provision of equity across environmental and social spectrums.

This plan will guide Council in delivering its [Community Strategic Plan](#)

Objective 1

We have healthy spaces and places

- 1.3 Provide for a healthy and active future • Ensure recreation opportunities and facilities to meet changing needs

Objective 2

Our community is an inviting and vibrant place to live

- 2.1 Enable accessible and affordable lifestyle options
- 2.2 A shared responsibility for community safety
- 2.3 Promote our unique position in the region
 - Monitor and regulate environmental and food safety standards
 - Coordinate and promote events and tourism

Objective 3

Our economy is growing and supported

- 3.1 Plan for and develop the right assets and infrastructure
- 3.2 Encourage economic development
- 3.3 Promote our community as the place to visit, live, work and invest
 - Promote and support business investment and employment growth
 - Provide visitor information services
 - Develop and promote tourism

Objective 5

Our community understands and embraces environmental change

- 5.1 Encourage respectful planning, balanced growth and good design
- 5.2 Respond to our changing environment
- 5.3 Value, protect and enhance our natural environment
 - Encourage sustainable land use

- Plan for the impacts of drought
- Undertake bush and riverside regeneration

Objective 6

We use and manage our resources wisely

6.4 Identify and make best use of our land

- Support the protection of our land through long term planning
- Plan community spaces wisely

This plan of management applies to the contiguous parcels of Crown reserves, beginning within the town limits and includes land made available for camping and recreation along the Gwydir River beyond the town limits towards Copeton Dam.

The Gwydir Shire Council has been appointed by the Crown Lands Division to manage the affairs of the reserve trust and this plan outlines measurable and achievable ways to meet the Crown Management Principles:

- (a) that environmental protection principles be observed in relation to the management and administration of Crown land,*
- (b) that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible,*
- (c) that public use and enjoyment of appropriate Crown land be encouraged,*
- (d) that, where appropriate, multiple use of Crown land be encouraged,*
- (e) that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity, and*
- (f) that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.*

The main attraction for the reserves lies in the intrinsic values associated with a natural bushland setting; the scenic riverside location with associated facilities, and the undeveloped nature of these areas.

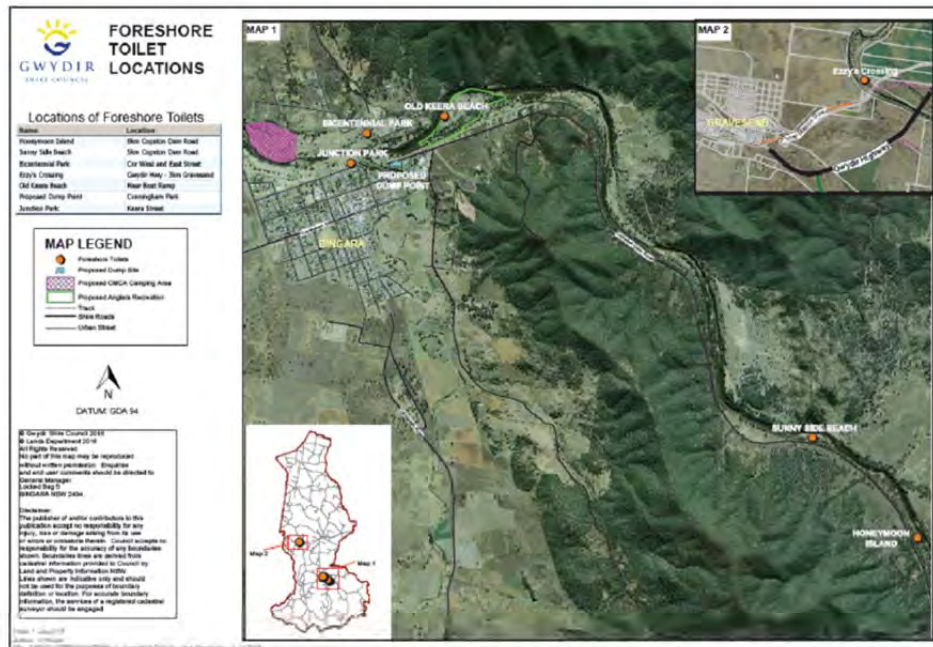
The reserves are accessed by visitors and members of the community who use the reserves for a number of recreational pursuits such as; fishing, swimming, walking, cycling, water craft and camping.

Access to the riverside reserves is gained via a number of unformed roads; the reserve areas provide minimal built user facilities, there are no toilets at present although some are planned or barbeque/picnic areas.

The construction of toilets is proposed at the following locations:

Junction Park;
Bicentennial Park;
Old Keera Beach;

Sunny Side Beach or Honeymoon Island;
Glacial Area (This location is outside the area of this Plan of Management); and;
Ezzy's Crossing near Gravesend (This location is outside the area of this Plan of Management).



By preserving the intrinsic values of the reserves we satisfy the Community Strategic Plan Objectives 2.1, 2.3, 3.3, 5.1, 5.3, and 6.4.

The desired outcomes from the implementation of the management plan are as follows:

- To provide high conservation value habitat for terrestrial and aquatic flora and fauna;
- To provide high natural amenity opportunities for recreation;
- To provide buffers to help sustain healthy water quality; and;
- To support sustainable economic activities, such as recreational fishing and ecotourism.

1. Introduction

1.1 Purpose and development of this plan

The purpose of this Plan of Management is to establish the framework and operational procedures for the Riverside Crown Reserves. The plan has been developed in order to encourage public use of the reserves, while ensuring the safety of visitors and without degrading the natural landscape. The lands are Crown Reserves under the provisions of the *Crown Lands Act 1989, as amended*, with the care, control, use and management vested in the Gwydir Shire Council.

Each of the reserves is currently used for camping and recreation by the public.

Current unrestricted use and demand for riverside camping and recreation are having some negative social and environmental impacts.

This document puts forward an action plan to provide best practice for the sustainable management of the Crown Reserves outlined. This management plan has been developed to include the principles of Crown land management, Council's priorities, as outlined in the Community Strategic Plan and the [Bingara Town Strategy](#) which include community values for the reserves.

This management document will assist in the development and enforcement of procedures that fulfil Council's statutory obligations under the *Crown Lands Act 1989*, and ecologically sustainable awareness and development for the Gwydir Shire Council and its residents.

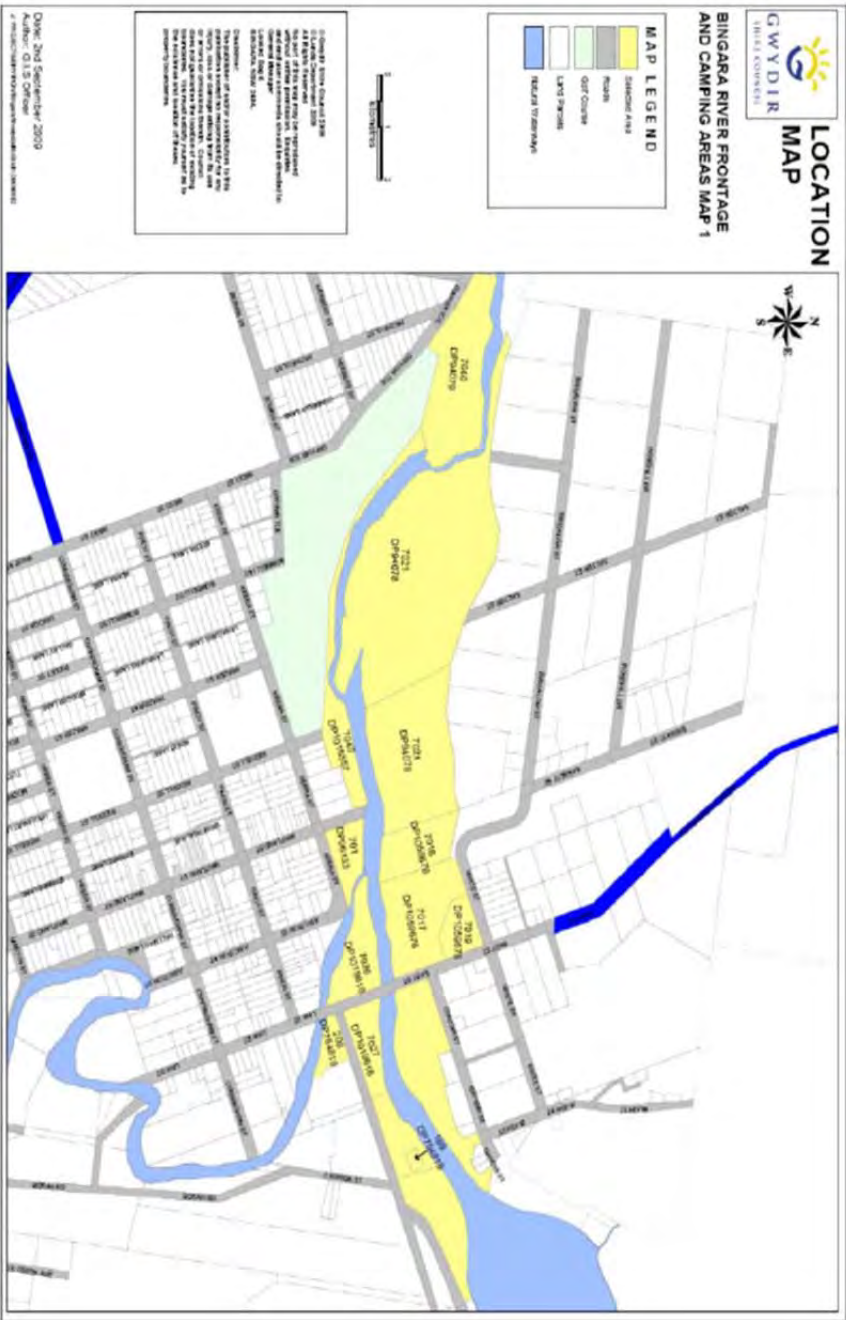
1.2 Description of the land

The subject land is located within the township of Bingara and is bisected by the Gwydir River.

On the north side of the river the land comprises of Lot 7021 DP94078, 7018 DP 1059678, Lot 7019 DP1059678, 7017 DP1059678. While on the southern side of the river it comprises of Lot 7040 DP94079, Lot 7040 DP1016557 Lot 701 DP96133, Lot 7026 DP1019618 Lot 7027 DP1019618 & Lot 189 DP754819 and Cunningham's Park. (See Map 1).

Further sections of land beyond the town limits are also included in this plan, and include sections of the Gwydir River banks available for free camping, and accessed at various points along the Copeton Dam Road.

The ongoing management of the more formal parkland areas of Junction Park, Bicentennial Park and Cunningham Park are handled as a component of the maintenance regime for the Bingara town parks and gardens.



This is page number 128 of the minutes of the Community Services and Planning Committee held on Thursday 9 February 2017

Chairman

1.3 The legal status of the land

The Gwydir River Reserves are Crown Lands administered under the *Crown Lands Act 1989* and the *Crown Lands Regulation 2006*. The land is reserved for the public purpose of recreation; it is not community/operational land classified under Part 2 of the *Local Government Act 1993*.

1.4 Reserve Access & Usage

The land areas have a number of unformed/unsealed dry weather roadways that generally traverse in a westerly and easterly direction across the parcels of land in question following the alignment of the Gwydir River. These roads form part of the established Scenic River Drives.

The most westerly (downstream) access point is from Faithful Street below the golf course.

The northern portion of the reserve has an access road veering off the bend section to the south of White Street. Access can also be gained from the end of Salter Street; both accesses head towards the river then run parallel forming a part of the Scenic River Drives.

Heading in an Easterly direction out of Bingara, along the Copeton Dam Road, there are multiple access points to the riverside and camping areas.

The Boat ramp is accessed from the fork in Copeton Dam Road opposite the Bingara MPS (Hospital), just before the Water Treatment plant heading east. There is another access point off the end of Old Keera Road.

The remaining access points occur at various distances along a stretch of Copeton Dam Road for approximately 8 kilometres.

Each of the reserves is currently used for camping and recreation by the public on an informal basis. Camping is in mobile homes, tents, caravans, and campervans.

2. Management Context

2.1 Legislative Requirements

The main legislative and policy requirements which apply to the reserve are the *Crown Lands Act 1989*, with the care, control, use and management vested in the Gwydir Shire Council.

The other relevant legislation and associated regulations applicable to the management of land outlined in this document has been considered in the remediation activities listed in the 'Action Plan' and are as follows:

The Local Government Act 1993;
Fisheries Management Act 1994;
Native Vegetation Act 2003;
NSW Threatened Species Conservation Act 1995;
Catchment Management Authorities Act 2003;
Companion Animals Act 1998; and;
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

2.2 Principles of Crown Land Management

Section 10 of the Crown Lands Act 1989 requires the Land and Property Management Authority (LPMA) *to ensure that Crown Land is managed for the benefit of the people of NSW.*

These principles are aimed at recognising and protecting the intrinsic values of the land, and its natural, cultural and social resources for the benefit of present and future generations.

The Principles of Crown Land Management are defined in Section 11 of the Act:

That environmental protection principles be observed in relation to the management and administration of Crown land;

That the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible;

That public use and enjoyment of appropriate Crown land be encouraged;

That, where appropriate, multiple use of Crown land be encouraged;

That, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity; and

That Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.

2.3 Other Guiding Principles

This Plan of Management has been developed to integrate with a range of other planning documents which relate to mitigating social and environmental impacts.

The following documents have been incorporated into this management document to steer the future use and development of the reserves.

The key documents and a brief summary of their contents follow:

Gwydir Shire Council Community Strategic Plan 2013-2023;

This plan provides community values for the Gwydir River and the Reserves, based on the community consultation which was reported in the plan.

Border Rivers-Gwydir 2013-2023 Catchment Action Plan:

The CMA Catchment Action Plan (CAP) lists priority actions for the Gwydir as:

Manage total grazing pressure;
Manage threatening processes including weeds, feral animals, aquatic pest species, soil erosion, soil fertility decline;
Improve community capacity through research, education and training and

access to services;
Improve water quality;
Restore balance to native vegetation across the landscapes (control woody growth on upper slopes, regenerate lower slopes and floodplains); and;
Protect and rehabilitate riparian and in-stream habitat.

Draft NSW Invasive Species Plan 2015-2022

The NSW Invasive Species Plan identifies four goals to realise its vision, these goals aim to deliver specific measurable outcomes and actions that complement the NSW targets for natural resource management as identified in the NSW State Plan (above):

- Exclude – prevent the establishment of new invasive species
- Eradicate or contain – eliminate, or prevent the spread of new invasive species
- Effectively manage – reduce the impacts of widespread invasive species
- Capacity building – ensure NSW has the ability and commitment to manage invasive species.

2.4 Community Consultation

Community consultation is an integral part of the process of preparing a Plan of Management.

Pursuant to Section 113, *Crown Lands Act 1989*, the Draft Plan once accepted by the Gwydir Shire Council, will be placed on public exhibition for a period of 28 days.

Furthermore community consultation has been incorporated in this plan of management, through the Gwydir Shire Council's overall past strategic planning process.

Specific input has been sought from The Bingara Anglers Club and other internal and external stakeholder groups.

3. Reserve Values & Issues

3.1 Environmental Values

The Gwydir River foreshore reserves form part of a riparian environment which follows the course of the Gwydir River, making this a significant habitat corridor for biodiversity.

A riparian habitat is the transition zone between terrestrial and aquatic environments, performing a range of important environmental functions, protection and restoration of these environments is essential for maintaining and improving the ecological functions of the river¹.

Degradation of riparian vegetation along NSW waterways is a listed Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*, as such the range of

¹ Australian River Restoration Centre, 'Sound management of riparian lands', <http://arcc.com.au/resources/sound-management-of-riparian-lands/> Accessed: September 2013.

functions the riverside reserves support are an important focus in the public understanding and use of the river corridor reserves.

Riparian corridors are important for wildlife use, providing food, habitat and shelter from predation, as well as allowing for movement along differing vegetation communities.

The Gwydir River frontage follows the Gwydir River into and out of the township, and is adjacent to the Bingara State Conservation Area and The Bingara State Forrest providing an essential habitat corridor for aquatic and land species, to be using for migration from the reserve to beyond the town limits².

3.2 Environmental Issues

As the Reserve Trustee, the Gwydir Shire Council is responsible for the environmental management of the land making up their reserves, as such the Gwydir Shire Council commissioned the services of Ecologist Dr J Hunter to undertake an investigation of the flora and vegetation of the reserve (see attachment for full report) in order to:

- a) Assess the condition of the riparian vegetation communities;
- b) Assess the occurrence of threatened ecological communities & threatened flora species;
- c) Identify weeds; and;
- d) Assess the occurrence of other potential management issues.

It has been observed that some of the current uses of the reserves are having some negative impacts on the environment.

The following table extracted from the ecological report lists the processes occurring at the reserves which are posing a threat to the quality of the environment and its functions, as well as outlining the Act to which it relates.³

Threatening Processes Likely To Be Occurring At The Reserves		
Activity	Type	Status
The degradation of native riparian vegetation along NSW water courses	Habitat change/loss	NSW Fisheries Management Act
Predation by the European Red Fox Vulpes vulpes (Linnaeus 1758)	Pest Animal	TSC ⁴ Key Threatening Process
Removal of dead wood and dead trees	Habitat change/loss	TSC Key Threatening Process
Invasion of native plant communities by exotic perennial grasses	Weed	TSC Key Threatening Process
Clearing of native vegetation	Habitat change/loss	TSC Key Threatening Process

² Australian Government, 'Habitat Management Guide', <http://www.northern.cma.nsw.gov.au/downloads/publications/rivers-and-wetlands/pub-riparian-habitat-management.pdf> Accessed: September 2013.

³ Dr J Hunter, 'Management Issues: Public Usage' in *Flora, Vegetation & Management Considerations: Gwydir River – Bingara*, 2013, p.26.

⁴ NSW Threatened Species Conservation Act 1995 (TSC)

Loss of hollow-bearing trees	Habitat change/loss	TSC Key Threatening Process
Loss and degradation of habitat by invasion of escaped garden plants	Weed	TSC & EPBC ⁵ Key Threatening Process
The removal of large woody debris from NSW rivers and streams	Habitat change/loss	NSW Fisheries management Act
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Habitat change/loss	TSC Key Threatening Process

The main findings of the report highlight the following:

All of this community falls within the Endangered Aquatic community in the Natural Drainage System of the Lowland Catchment of the Darling River;

Implicit in this determination is the protection of associated vegetation to enable the persistence of the aquatic community that depends upon it;

Key threats to this endangered aquatic community include any man-made structures, alteration of flow (such as water extraction), removal of vegetation, sedimentation, insecticide runoff, overfishing, removal of snags, introduction of aquatic and streamside introduced pests and changes in nutrient loads;

Some control needs to occur as significant environmental change has already occurred, at camping sites along the river's edge due to high edge to area ratio; and;

A sustainable recreation strategy needs to be put into place that incorporates the restoration of existing degraded sites and the prevention of further damage.

The natural riparian vegetation of each of the reserves provides a range of important functions for the health of the riparian ecosystem and for supporting biodiversity.

The vegetation is dominated by the Weeping Bottlebrush (*Callistemon viminalis*) and River Sheoak (*Casuarina cunninghamia*), and *Eucalyptus* sp. providing a buffer to the river's edge from the more open grassed areas of the lower flood terraces behind.

Weeds are a significant problem throughout the reserves, with a range of species present.

Clearing and vandalism of vegetation on the reserves for firewood also diminishes environmental values and creates potential soil erosion problems, as does the soil compaction and loss of vegetation caused by uncontrolled vehicle access and grazing pressure by horses.

Flooding has the most dramatic impact on the reserves, with significant loss of topsoil and stripping of vegetation at most locations following flood events.

Degradation of biodiversity is one of the most important environmental problems to be addressed in the management of the Reserves. Biodiversity is the variety of all life forms, the diversity of genes they encompass as well as the ecosystems in which they interact with. The activities required to address biodiversity health have a focus on those which aim

⁵ Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

to rehabilitate and retain the remaining habitat. Rehabilitation is the process used to create a healthy, natural self-regulating environment, which is close as possible to its original state,⁶ and as such rehabilitation and conservation of remaining habitat is an important objective for this Management Plan.

The NSW Biodiversity Strategy states that the main threats to biodiversity are feral animals, invasive weeds, and land clearing⁷ all of which are issues found to be having an impact on the Gwydir River.

Loss of native vegetation, due to land usage and flood events, may also be contributing to a reduction in the function of the River Foreshore as an important habitat corridor, and will be addressed in the management objectives and activities.

3.3 Environmental Management Requirements

Under the provisions of the *Crown Lands Act 1989* the management and administration of Crown reserves must ensure that environmental protection principles are observed, this is a legal responsibility, reflecting the importance of protecting and enhancing the environmental values of natural areas.

Gwydir Shire's environmental responsibilities under the act can be classified as follows:

- Weeds and pest animals must be appropriately managed;
- Threatened species and their habitats must be protected; and;
- Aboriginal and Environmental Heritage items must be protected.

4. Recreational Values & Issues

4.1 Recreational Values

The Gwydir River and river frontage also provide an integral component for a wide range of community recreational activities and social gatherings.

The natural environmental values of the riverside Crown Reserves are the major elements responsible for their intrinsic appeal.

The Reserves are significant in area and are easily accessed by vehicle or on foot at a number of unsealed road access points. Easy access to the riverside has made the reserves a popular spot for locals and visitors to pursue a number of recreational activities: fishing; walking; cycling; horse riding; canoe/kayaking; boating; picnicking; sightseeing; swimming; nature observation; and; bushwalking are all popular pursuits.

The reserves currently promote the natural assets and do not make provision for toilet and waste amenities and this lack of appropriate ablution facilities is planned to be addressed.

⁶ B Knox et.al, *Biology: An Australian Focus* McGraw-Hill, Australia, 2010, pp. 1102-1118.

⁷ Department of Environment, Climate Change and Water NSW,
<http://www.environment.nsw.gov.au/biodiversity/nswbiostrategy.htm>, Accessed: September 2013.

4.2 Recreational Issues

The natural environmental values of the riverside reserves which attract people for camping and recreational activities are also the elements which are most under threat from the continued unregulated use for these activities.

Historically, the reserves have been used by the local community for water-based recreation, river access and traditional bush camping, however, in recent years there has been a significant increase in visitor numbers, and much of the sites have become subject to overuse – particularly during the Christmas and Easter periods, where there has been a significant shift from traditional bush camping, to large motor homes accessing the riverbank at a number of sites, hence the impact of recreational and camping is increasing on the reserve areas.

Dr J Hunter's ecological survey report outlines that there is seasonal but significant public usage of accessible areas of the riverbank particularly for recreational fishing and camping which is causing many areas of the river, particularly where the floodplain is extended and amenable, to have a number of its ecological processes disrupted and habitat to be downgraded or destroyed.

Continued inappropriate recreational use of the reserves will lead to long term environmental degradation including loss of vegetation cover, soil erosion, reduced water quality, reduced wildlife habitat and the accumulation of pollutants in the river system.

Specifically, the report⁸ outlines a number of issues arising from such informal usage of the riverside reserves and include amongst many:

Faecal Pollution - toilet facilities are not available on the reserves and must be addressed. Weekly Compliance inspections have not detected deliberate faecal pollution from contained toilet units. There is the possibility that some campers could be using inadequate toileting facilities that primarily include holes in the ground that are roughly covered up. This behaviour can cause disease and unsanitary water quality, for both human and local native animals;

Non-native Animals – domestic pets were present at camp sites, primarily dogs which were at times unleashed. Native animals including possums, kangaroos, wallabies, lizards, birds as well as rare and threatened fauna, are at threat from domestic animals.

Many native animals are very prone to stress-related diseases; these diseases can be brought on by contact with humans and domestic pets. Unrestrained pets are one of the greatest threats to native wildlife. The presence of non-native animals at bush campsites will deter the breeding of native animals;

Rubbish – waste facilities are not available on the reserves and rubbish was noticed at a number of locations. Rubbish also includes food scraps, as its use by native animals is often detrimental causing dietary diseases. The transportation of rubbish is an issue at the reserves as it is likely to flow downstream during high water periods.

⁸ Dr J Hunter, 'Management Issues: Public Usage' in *Flora, Vegetation & Management Considerations: Gwydir River – Bingara*, 2013, p.26-29.

Firewood - Firewood collection has occurred in all areas where campsites were common and showed a total denudation of any on ground woody material, nor were dead standing trees seen in areas where public usage was high. Even small woody debris was cleared from areas of high camper usage. Larger fallen trunks were seen to have been very recently cut by chainsaw. Fallen timber is a key habitat feature that provides shelter for reptiles, frogs, small mammals and numerous invertebrates. Loss of fallen logs changes the ground microclimate which affects soil organisms below fallen logs as well as changing the above ground plant cover. The removal of dead wood and dead trees is listed as a TSC key threatening process.

Noise - Many native animals are highly prone to stress and can die from excessive stress. This can occur from human generated noise and machinery movement. This is particularly so during peak holiday periods and during night time when both noise and light can cause disturbance.

Clearing - While large scale clearing is not occurring, many small scale clearing events are happen each time a camp is set. This includes 'tidying up' such as flattening of grounds for tents, associated equipment and for campfires. These small events are at times minor and recoverable however areas which are more commonly used have little time for proper recovery leaving such sites prone to weed invasion and establishment.

Weeds - Introduced plants require disturbance or modification of the environment to become established. The extensive use of the river bank shows that this is occurring at a very high rate. Across the survey sites 25% of the species found were exotic. One community had 42% of its listed species as non-natives. This survey was conducted only during a single time of year and many other species may be present that were not recorded. Activities which promote weeds include; nutrient addition from the dumping of food scraps and toileting, trapped in dirt and mud on vehicles and clearing activities. There are a number of weedy taxa present that are likely to cause serious environmental problems and loss of diversity if left unchecked and some of these species are listed as Key Threatening Processes on the TSC Act.

Flooding - The areas which are currently used for camping are right at the river's edge. These areas are subject to flooding, and the floods of early 2009 gave an indication of river levels during a major flood event. The prevailing damage from flooding should be considered when addressing suitability of camping locations and allowable activities.

Traffic

Undefined use of the unsealed roads causes conflicts between pedestrian and vehicular traffic, given its diversity of users, lack of signage indicating direction, speed and adherence to designated roads.

Braiding of roads would be reduced with regular grading of the existing roads. The last co-ordinated grading of the roads occurred over 6 years ago.

Access

There is anecdotal evidence of the issue of reduced access to the river bank. Where access to the river bank has been restricted by camp sites established on the bank.

The Bingara Anglers Club advised that during the Easter Public Holiday period their members have been unable to establish a camp site at their preferred location due to existing camps already having being established. This Plan recommends the allocation of a dedicated area for the exclusive use of the Bingara Anglers' Club at the boat launching ramp located adjacent to the Bingara Water Treatment Plant. This section of the foreshore is actually designated as part of the river rather than the foreshore.

The majority of camp sites are established as close as possible to the river bank and therefore increase the risk of erosion of the bank. A highly valued site after it is vacated by one set of campers may be occupied soon after without the site having any significant period of time to rehabilitate.

4.3 Enforcement

Penalty notices under the *Crown Lands Regulation 2006* (the Regulation), the *Crown Lands (General Reserves) By-law 2006* (the By-law) and the *Companion Animals Act 1998* for behaviour that contravenes the provisions of the Regulation or By-Law may be issued by the Council.

Penalty notices are, in effect, on-the-spot fines, which can be issued for breach of a list of offences specified in the Regulation and the By-law. Some Traffic and Vehicular offences would be referred to the appropriate enforcement authority.

Situations that require enforcement include:

- Fires – particularly in environmentally sensitive areas or during fire bans;
- Removal of native flora or fauna;
- littering or dumping of rubbish;
- Pollution;
- Residing illegally on the reserve;
- Unpermitted stock grazing;
- Removal of warning signs or other signage;
- Pets – not under effective control and attacks; and;
- Speeding, unregistered and abandoned vehicles-referral to local police.

5. Economic Values & Issues

5.1 Economic Values

There is no business or commercial focus to the existing activities within the reserves.

However the reserves provide economic value to Bingara township from the local tourism and business provided from visitors who travel to the area for free riverside camping, particularly during the peak times of Christmas and Easter.

5.2 Economic Issues

The reserves are all undeveloped, and have minimal facilities to support recreational uses – particularly camping.

The Shire has installed a Boat Ramp and fish cutting table.

Potential future capital improvements for the reserves should include the provision of toilet facilities, which will in large part be grant funded. This could assist with the future development and promotion of the reserves, as well as managing the perceived public and environmental health issues currently associated with faecal pollution.

A camping fee may be required at some point in the future to fund the maintenance and further implementation of amenities but the collection of fees is difficult without the appointment of dedicated staff to administer the overall reserve area.

Additional economic growth for the improved management of the reserves can be sought through the application of various funding initiatives.

6. Risk Management

6.1 General Requirements

Council's Work Place Health and Safety Policy and Community Strategic Plan state the Council has a duty of care to manage and minimise the risk of reasonably predictable events, to employees and all users of the areas covered by this plan.

6.2 Visitor Safety public liability- Identified risks are; traffic collision land and water, falling trees and limbs, public health issues, rope swings, drowning, submerged objects, dog attack

6.3 Fire - refer to SES plan for flood/fire

6.4 Flood – refer to SES plan for flood/fire.

6.5 Feral Animals – As per NSW Invasive Species Plan 2015-2022 requires the Land manager (Council for the purposes of this plan) to;

- Goal 1: Exclude. Prevent the establishment of new invasive species;
- Goal 2: Eradicate Or Contain. Eliminate or prevent the spread of new invasive species;
- Goal 3: Effectively Manage. Reduce the impacts of widespread invasive species; and;
- Goal 4: Capacity. Ensure NSW has the ability and commitment to manage invasive species.

6.6 Weed Control – North West Regional Weed Committee Weed Action Program 2015-2020. Areas are regularly inspected by noxious weeds officers and the appropriate action is taken to control weeds detected. Bio-Links projects that the Council is currently participating in all have specific weed control actions.

The following risk assessment matrix evaluates the likelihood, consequence and control measures for each risk identified.

RISK ASSESSMENT MATRIX

Id	Description of Risk (including any identified 'triggers')	Impact on Project (Identify consequences)	Assessment of Likelihood	Assessment of Seriousness	Grade (combined Likelihood and Seriousness)	Date of Review	Mitigation Actions (Preventative or Contingency)	Responsibility for mitigation action(s)	Cost	Timeline for mitigation action(s)
6.1	Injury from boat near boat ramp	-Personal injury -financial loss	C	Major	High	2018	-signage restricting swimming near boat ramp -inspection	-DDES ⁹ -Compliance Officer	-signage \$400 -inspection 3 hours per week done with regular inspection of area	-3 months - ongoing
6.2	Dog roaming and/or attack	-Personal injury	B	Moderate	High	2018	-signage dogs to be controlled -inspection -enforcement policy -companion animals act	-DDES -Compliance Officer	-signage \$800 -inspection 3 hours per week done with regular inspection of area	-3 months - ongoing
6.3	Black Water release and faecal pollution	-Health -water pollution -land contamination	C	Major	High	2018	-inspection -signage -enforcement policy -POEO Act ¹⁰	-DDES -Compliance Officer -EPA	-inspection 3 hours per week done with regular inspection of area	-3 months - ongoing

⁹ Director Development and Environmental Services
¹⁰ Protection of the Environment Operations Act 1997 (POEO Act)

6.4	Drowning/Injury from swimming, collision and submerged objects	-Personal injury -property damage	B	Major	High	2018	-signage warning of swimming dangers	-DDES	-signage \$800	-3 months
6.5	damage and/or injury from falling branches and trees	-Personal injury -property damage	B	Major	High	2018	-signage warning of dangers -inspection	-DDES -Compliance Officer	-signage \$800 -inspection 3 hours per week done with regular inspection of area	-3 months -ongoing
6.6	Roads	-Personal injury -property damage -weed proliferation	A	Moderate	High	2018	-signage -policing -grading	-DDES -Police -DTS ¹¹	-signage \$800 -grading \$5000	-3 months -ongoing
6.7	Fire	-Personal injury -property damage -loss of habitat -loss of bio diversity	C	Major	High		-signage -policing	-DDES -Compliance Officer -RFS ¹²	-inspection 3 hours per week done with regular inspection of area	-in place -ongoing
6.8	Flood	-Personal injury -property damage -loss of habitat -loss of bio diversity	C	Major	High	2018	-signage -early warning	-State Water -DDES -SES ¹³	-signage	-in place -ongoing

¹¹ Director Technical Services
¹² Rural Firs Service
¹³ State Emergency Services

6.9	Feral Animals	-Personal injury -property damage -loss of habitat -loss of bio diversity	B	Minor	Medium	2018	-signage -policing -minimisation practices -eradication programs	-DDES -Compliance Officer -DPI ¹⁴ -LLS ¹⁵	-signage \$800 -inspection 3 hours per week done with regular inspection of area	-3 months - ongoing
6.10	weeds	-loss of habitat -loss of bio diversity	B	Moderate	High	2018	-inspection -weed treatment	-DDES -weeds officers -DPI	-inspection 4 hours quarterly -weed treatment as needed -chemical for treatment	-3 months - ongoing

¹⁴ Department of Primary Industries
¹⁵ Local Land Services

7. Action Plan - Objectives & Outcomes

7.1 Overview of Reserve Management Objectives

- Protect the environment;
- Conserve the natural resource;
- Encourage public use;
- Encourage multiple use; and;
- Manage land and resources sustainably.

7.2 Visitor Management

The behaviour of visitors should be managed to achieve the outcomes outlined through increased awareness and enforcement.

7.3 Facility Management

Any current facilities should be maintained at a safe and functioning standard. Any new facilities would be maintained to these standards.

7.4 Environmental Management

The Council should continue to manage the natural environment to reduce the impact of visitors and invasive species whilst also continuing revegetation and rehabilitation projects which will restore and enhance the ecological functions of the area as a riparian habitat.

This would be achieved by increasing awareness of the impacts of certain activities and the prohibition or limiting of certain damaging, degrading or threatening activities.

7.5 Financial Management

7.6 Leasing & Licensing Management

Local Councils as reserve trust managers can be authorised by the Minister for Lands to grant leases, licences and related easements over the Crown reserves they manage in certain circumstances (as defined by the Minister for Lands) without the need to obtain the Minister for Lands' consent.

The provision enables Councils, where it is warranted and appropriate, to have similar levels of autonomy and accountability over Crown land as they have under the community land provisions of the *Local Government Act 1993*.

The Council must within 14 days of using this power notify the Minister of the terms of the grant.

Although there are no current plans to lease or license any of the areas to which this plan is applicable, there has been some preliminary discussions with the Campervan and Motorhome Club of Australia (CMCA) about formalizing a location under the control and management of the CMCA somewhere along the Gwydir River foreshore.

7.7 Monitoring and Reporting

Monitoring and reporting are essential components of the management plan. Ongoing monitoring of the areas that this plan is applicable would be undertaken by the relevant department conducting the activity. This includes the natural resources, council activity as well as visitors and their behaviours.

The Plan allows for assessments to be made about the effectiveness of activities, and the applicability of the objectives. In order to achieve and maintain environmental integrity, a management plan needs to clearly outline what the objectives for that environment would be, and what management activities could be implemented to achieve those objectives, and what methods and frequency of data collection we would use.

Action Plan

Action	Responsibility	Priority	Performance Measure
Develop policies, procedures and systems for the effective and efficient operation of the Camping Reserves	Council (DDES)	High	Policies, procedures and systems developed and implemented
Complete a Risk Assessment as part of the Plan and implement controls	Council (DOCD ¹⁶)	High	Risk Assessment completed and controls in place
Implement Crown Reserve Reporting System (CRRS) requirements to meet the Trusts annual reporting obligations	Council (Exec)	High	CRRS requirements established and implemented
Install appropriate facilities at each of the Camping Reserves to support the camping activity and day use of the reserves	Council (Exec)	High	Facilities installed in accordance with master plan S68 approval at each site
Develop long-term asset management plan and annual maintenance program (including costings). Prioritise future funding allocation based on asset management planning	Council (DTS)	High	Asset Management Plan prepared and Implemented
Ensure all assets are registered for insurance purposes	Council (DTS/DOCD)	High	Insurance register Maintained
Undertake annual review of Camping Reserve usage to determine if demand is increasing	Council (DDES)	High	Annual review of Camping Reserve usage undertaken
Work with key stakeholders specifically LLS to identify funding sources to further improve infrastructure as necessary	Council (Exec)	Ongoing	Key stakeholders informed and involved in future development plans
Work with key stakeholders, agencies and partners to develop and implement, monitor	Council (DDES)	High	Environmental Management Plans

¹⁶ Director Organisation & Community Development

and review an Environmental Management Plan for each of the Reserves			developed, implemented, monitored and reviewed as necessary
Undertake appropriate vegetation management, and work with stakeholders where possible to implement vegetation management strategies	Council (DDES)	Ongoing	Vegetation management strategies developed and implemented
Undertake pest and weed management at each Reserve in conjunction with appropriate agencies	Council (DDES)	Ongoing	Weed and pest Management strategies developed and implemented
Identify items of significance such as; heritage items, items of cultural significance, and plants and animals of environmental significance e.g. threatened or endangered, on the reserves which require protection.	Council (DDES)	High	ecological survey of all areas and significant items identified
Appropriate signage, including copies of by-laws if applicable, to be displayed in prominent locations. Use of media release and other publications to inform visitors of the acceptable activities and behaviour on reserves, and the relevant enforcement action for non-compliance.	Council (DDES)	High	Signs erected and decrease/increase of behaviours
Grade roads	Council (DTS)	High	Roads graded and areas accessible by roads
Gather base line data to identify the values of the reserve to the community.	Council (DDES)	High	Surveys conducted and data collated
Littering signage	Council (DDES)	High	Reduction in littering instances
Manage waste disposal-increase number of bins at Cunningham Park	Council (DDES)	High	Waste disposed of appropriately
Limit duration of stay for campers	Council (DDES)	High	Visitors do not overstay
Define permissible, event and non-permissible camping zones	Council (DDES)	High	Areas identified and appropriate signage erected and VIC materials produced
All visitors must have toilets if toilets are unavailable at the proposed camping location	Council (DDES)	High	Number of non-compliant users identified and fined
Defined vehicle access corridors	Council (DDES)	High	
Manage noxious weeds	Council (DDES)	High	Weeds are reduced/contained
Manage feral animals	Council (DDES)	High	Identify feral animal numbers and type and reduce
Riverbank edge walkway/riding trail - Create stable and shaded river edge landscapes with native trees to allow a walk, horse-ride trail along riverfront.	Council (DDES)	Medium	Walkway trail created
grazing pressure	Council (DDES)	High	
Implement interpretive walk ways outlining	Council	Medium	Walkways are defined

the natural and cultural values of the flora and fauna of the area, as well as the implementation of nature observation stations.	(DDES)		and observation stations are installed.
Facilitate sustainable recreational use by encouraging cyclist and walkers to use designated paths, and limit vehicular access to minimum designated paths.	Council (DDES)	High	Increased use of designated paths by cyclist and walkers. Decreased vehicle numbers.
Install shaded seating	Council (DDES)	Medium	Number of seats installed
Custom Designed picnic shelter, tables and chairs and viewing deck/garden, incorporating interpretive signage	Council (DDES)	Medium	Items installed
Move the camping activity away from the river's edge, leaving the area available for day use. This will also provide a buffer between the river's edge and camping ground during minor flood events.	Council (DDES)	High	Signage erected and VIC materials produced and reduced number of campers on rivers edge.

Management Issues

1 Access Roads

Undefined use of the unsealed roads causes conflicts between pedestrian and vehicular traffic, given its diversity of users, lack of signage indicating direction, speed and adherence to designated roads

RECOMMENDATION

- Install signage limiting speed to 15 km/hr and monitor/enforce
- Install one way signage and monitor/enforce
- Install signage restricting vehicular usage to certain roads or pedestrian/bike only tracks and monitor/enforce

Unrestricted access of Reserve entrance roads encourages vehicle usage and off road usage, and as such vehicles are using the river as a crossing, and driving off designated roads.

There will be increased control over the use of the roads by irresponsible drivers, particularly when the roads are wet.

RECOMMENDATION

- Install signage requesting limiting driving off formed tracks and monitor/enforce
- Install signage to restrict river crossing in areas by vehicles and monitor/enforce
- Install barriers such as rocks to limit vehicle access
- Install signage requesting to limit/or restrict access in wet weather and monitor/enforce

Once signage is in place the Council will be able to undertake enforcement compliance.

2 Environmental Issues

Environmental impacts include; erosion, destruction and loss of native vegetation, proliferation of weeds, feral animals and invasive fish species, significant reduction in native animal populations and diversity, loss of food and habitat for native, aquatic and land species.

RECOMMENDATION

- **Install signage restricting camping within 20m from the river bank/edge and monitor/enforce**
- **Install signage restricting collection of firewood and kindling and monitor/enforce. Investigate the most appropriate way to provide firewood including the sale of firewood in partnership with users and/or National Parks and Wildlife.**
- **Install signage restricting the clearing of campsites and monitor/enforce**
- **Install signage restricting the removal of flora, fauna and rocks and monitor/enforce**

Once signage is in place the Council will be able to undertake enforcement compliance.

3 Camping Issues

The existing camping activity has no formal approval, in place to support this use. Current use and demand for riverside camping opportunities will cause further degradation and negative environmental impacts if camping is allowed to continue in an uncontrolled manner.

RECOMMENDATION

- **Install signage restricting camping to a maximum of 7 continuous days at all sites within the Bingara designated town boundary and monitor/enforce**
- **Install signage restricting camping to a maximum of 14 continuous days at all sites outside the Bingara designated town boundary and monitor/enforce**
- **Introduce a 'no go' rotation of sites to be 'rested' to allow for rehabilitation**
- **Install signage and maintain the current event only camping area that limits access and allow exclusive access to the Boat Ramp section by the Bingara Anglers' Club and monitor/enforce**
- **Review the need to have a camping fee in June 2018 following the suggested capital improvements**
- **Continue discussions with CMCA regarding a possible partnering arrangement**

Management of camping to ensure compliance with regulations, currently there are challenges for regulating camping activities, due to a lack of information regarding acceptable activities, and a lack of clearly marked signage indicating permitted and non-permitted camping locations.

Area becoming overgrown and restricting campers access and potential fire hazard.

RECOMMENDATION

- **Facilitate grazing where appropriate to keep the grass down.**
- **Slash sites as needed/requested**

4 Compliance Issues

Issues requiring compliance actions include; littering, ablution and grey water waste disposal, duration of stay, camping within permitted areas, collection of firewood, safety of campers particularly if camps are located under gum trees, implementing the enforcement for non-compliance.

RECOMMENDATION

- **Install signage advising of camping restrictions and monitor/enforce**
- **Install signage advising of campers obligations and monitor/enforce**
- **Install signage advising of camping dangers and monitor/enforce**

5 Recreational Users

Ensuring the safety of recreational users including those swimming, fishing, kayaking, and boating. Issues with conveying the dangers of swimming unsupervised, collisions with boats and contact with submerged objects. Safety of pedestrians and cyclists sharing unsealed roads.

RECOMMENDATION

- **Install signage advising of dangers and monitor/enforce**

6 Possible Conflict Issues

Conflict between dogs and other users of the reserve including cyclists, pedestrians, joggers, horses and swimmers, vehicles.

RECOMMENDATION

- **Install signage advising of dangers/obligations and monitor/enforce**

Management of horses, unrestricted access to environmentally sensitive areas, conflict with users, unrestrained populations, and containment issues with horses escaping

RECOMMENDATION

- **Restrict access of horses through better administration, fencing and monitor and enforcement**

7 Public Amenities

Maintenance and enhancement of suitable public amenities

RECOMMENDATION

- **Install compostable toilets at suitable locations**
- **Keep the camp sites as basically 'primitive' with sufficient facilities to minimise environmental damage**

8 Unregistered and Unauthorised Vehicles

Unregistered/unauthorised vehicle usage, including motor bikes and jet skis.

RECOMMENDATION

- **Install signage advising of vehicle restrictions and monitor/enforce**
- **Refer unregistered vehicles to police out of Council's jurisdiction**
- **Ban the use of Jet skis in the Gwydir River**

9 Town Parks and Reserves

Each of the parks and reserves located within the town boundary of Bingara (Junction, Bicentennial and Cunningham Parks) need specific development plans to accommodate the growing usage of these areas by residents and visitors.

RECOMMENDATION

- **Develop facility plans for Junction, Bicentennial and Cunningham Parks including BBQs, additional covered tables and seating**
- **Investigate developing a child-safe water activity park in Cunningham Park adjacent to the existing swimming pool.**

Attachment

Dr J Hunter, ‘Management Issues: Public Usage’ in Flora, Vegetation & Management
Considerations: Gwydir River – Bingara, 2013

DRAFT

Gwydir River

Flora, Vegetation & Management Considerations: *Gwydir River - Bingara*



Prepared by Dr John T. Hunter of Hewlett Hunter Pty Ltd for
Gwydir Council

Final Report

March 2013

Gwydir River

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1. Introduction

Hewlett Hunter Pty Ltd was commissioned by Gwydir Shire Council to undertake an investigation of the flora and vegetation on the southern side of the Gwydir River approximately between Bingara and Little Bora Creek. The study area currently is primarily of crown lands used seasonally as an unregulated camping area.

1.1 Objectives

This investigation included the desktop assessment of potentially occurring Threatened Ecological Communities (TEC), Threatened Flora Species (TFS) and weeds. An on ground assessment was also to be undertaken in order to assess occurrence of these and other potential management issues.

1.2 Study Area

The project area is located within directly east of Bingara on the North Western Slopes and within the Nandewar Region of northern New South Wales. The local government area is the Gwydir Shire.

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2. Methodology

2.1 Potential EPBC Act Threatened Species & Communities

A set of potential threatened species that may occur within the study area was derived using the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters Search Tool (DSEWPaC 2012) and the New South Wales Threatened Species Conservation Act (Table 1). Targeted searches for these species were conducted throughout the study area. Table 1 contains the species and communities that may occur within the project area. Searches were not restricted to the species listed and the surveyor was mindful of other potential TFS and TEC that may not have been listed but could potentially occur.

Table 1: Threatened Community and Flora Species that may occur within the project area.

Entity	Conservation Status*	Potential to Occur in the Study Area
<i>Dodonaea stenophylla</i>	Presumed Extinct	High Potential
<i>Dichanthium setosum</i> (Bluegrass)	Vulnerable	Potential
<i>Digitaria porrecta</i> (Finger Panic Grass)	Endangered	Potential
<i>Homoranthus prolixus</i> (Granite Homoranthus)	Vulnerable	Unlikely
<i>Picris evae</i> (Hawkweed)	Vulnerable	Potential
<i>Polygala linariifolia</i> (Native Milkwort)	Endangered	Potential
<i>Rulingia procumbens</i>	Vulnerable	Unlikely
<i>Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions</i>	Endangered	High Potential
<i>Thesium australe</i> (Austral Toadflax)	Vulnerable	Potential
<i>Tylophora linearis</i>	Vulnerable	Potential
<i>White Box Yellow Box Blakely's Red Gum Woodland</i>	Critically Endangered	High Potential
<i>Homopholis belsonii</i> (Belson's Panic)		Potential

*Note threatened status on the 2nd January 2013.

2.2 Survey Design

The site was investigated using a series of 20 x 20 m full floristic survey sites. These sites were generally placed in a random fashion however special attention was given to habitats that were likely to have potential for specialised Threatened Flora Species (TFS), Threatened Ecological Communities (TEC) or where major environmental change was occurring. The location recorded

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using a GPS. Opportunistic recordings of flora species were also made. Though it should be due to seasonal variation, current high level of water being released from Copeton Dam and that not all areas were searched thoroughly the species list should not be considered in any way complete.

2.3 Data Management

‘Paradox 12 for Windows’ a relational database was used for data management, validation, storage and retrieval. ‘Parent’ tables were created with verified information that was used for data entry in ‘child’ tables allowing consistency in data entry (for example the spelling of species names). Three ‘parent’ tables were created to store information with six ‘child’ tables used for referential integrity, validation and data entry. The three ‘parent’ table’s stored information relating to the taxa found and the quadrats placed. The region number and site number were the relational fields used to link the three main tables. These three record values are unique and duplicate values were not accepted by the database. The system was designed to minimise the number of keystrokes, and allow for subsequent specimen determinations and results of analyses to be incorporated later without disruption.

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3. Results

A total of 36 full floristic survey sites were placed (Figure 2). In total 248 plant taxa from 66 families were found during this current survey of which 63 were of an exotic origin.

3.1 Vegetation Communities

Six communities are recognised as occurring along the southern bank of the Gwydir River between Bingara and Little Bora (Figure 1 & 2).

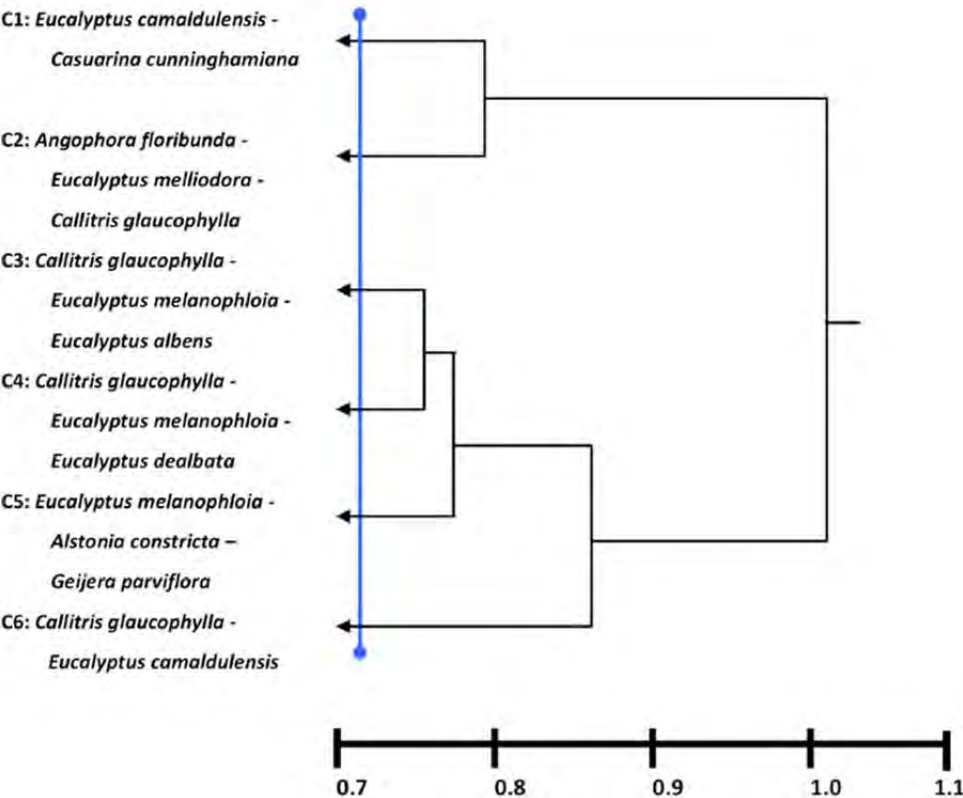


Figure 1: Summary dendrogram of dataset (Kulczynski association and flexible UPGMA fusion strategy. Communities are defined at a dissimilarity of c. 0.74.

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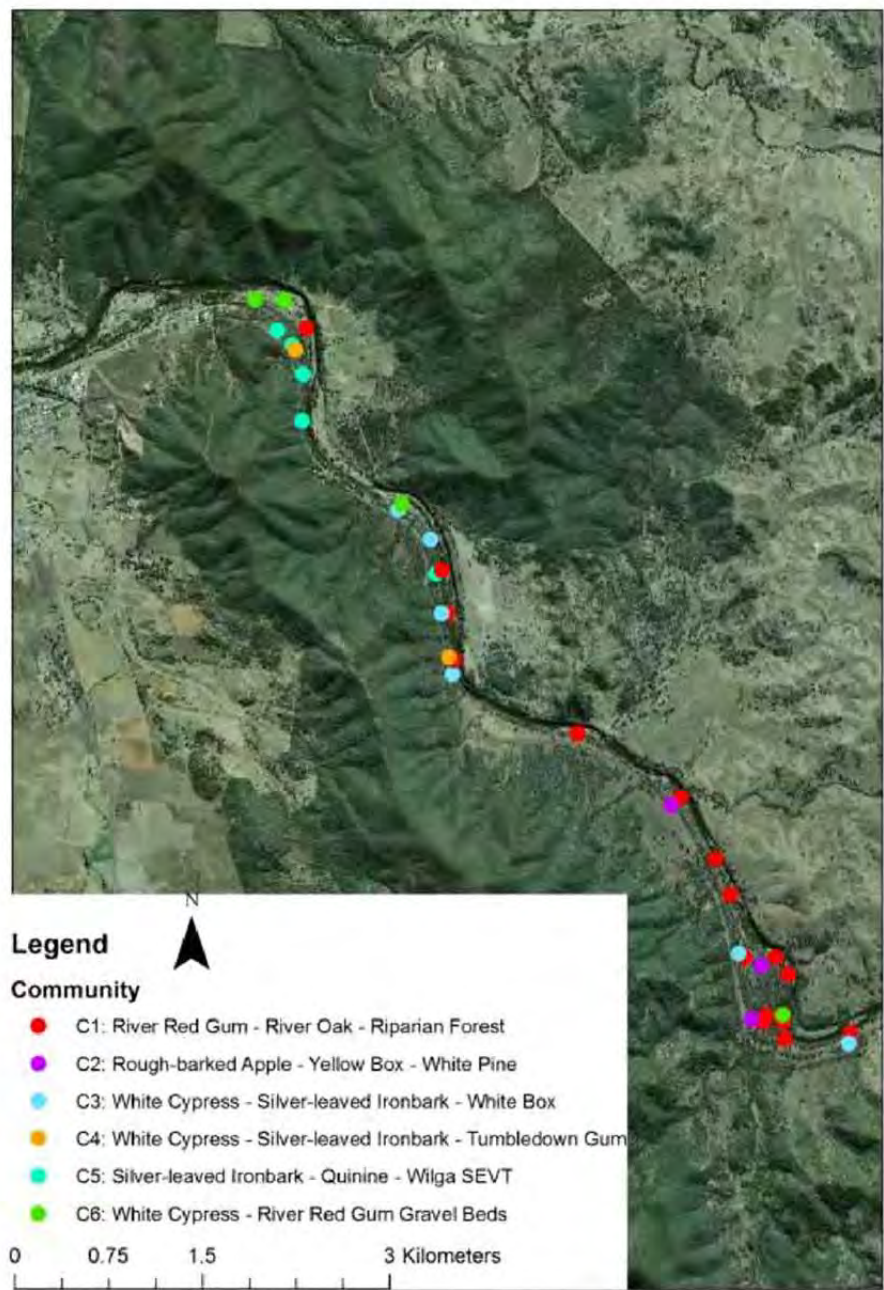


Figure 2: Placement of 36 full floristic survey sites and the floristic communities they occurred within.

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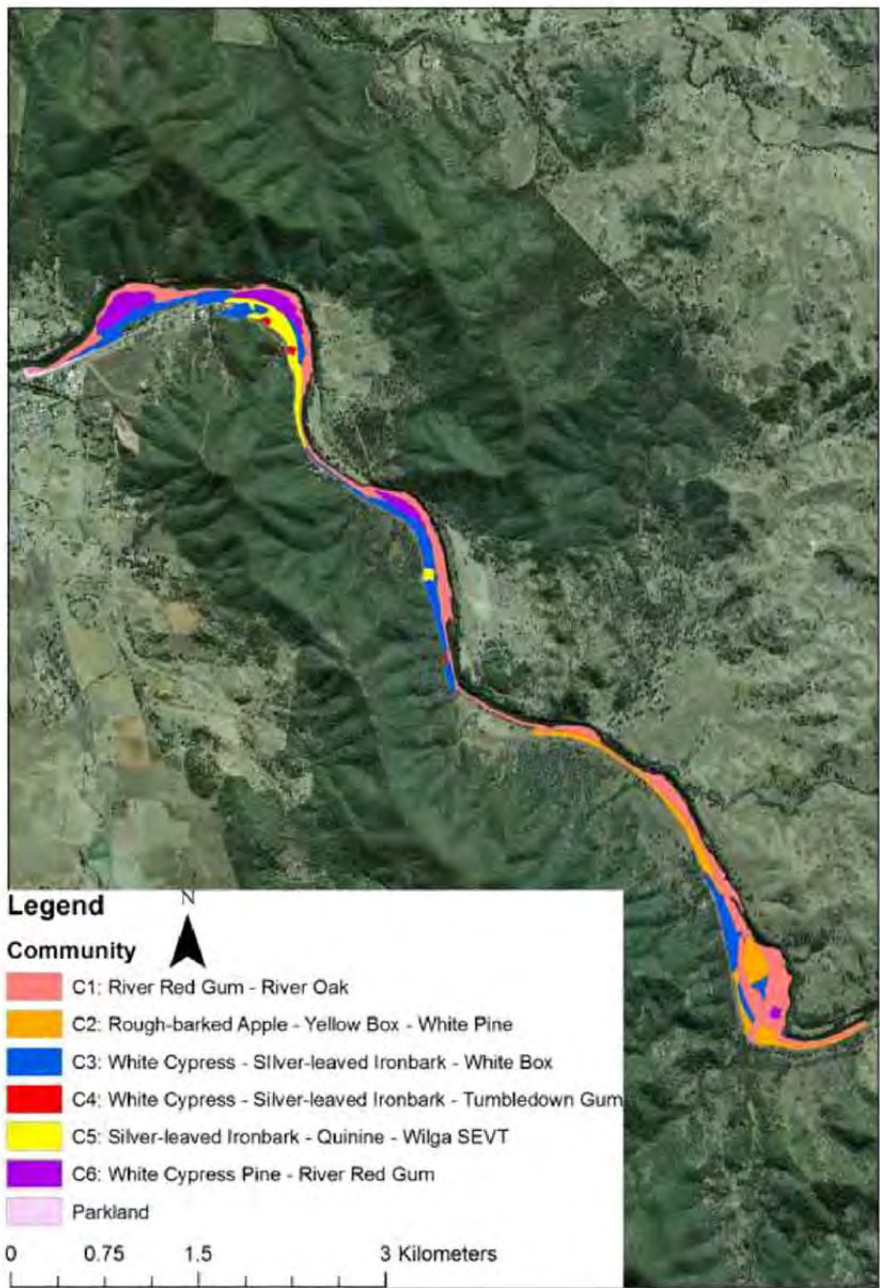


Figure 3: Mapped floristic vegetation units.

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3.1.1 River Red Gum (*Eucalyptus camaldulensis*) – River Oak (*Casuarina cunninghamiana*) Riparian Forest

Fisheries Act: Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River

http://www.dpi.nsw.gov.au/data/assets/pdf_file/0010/208297/FR22-Darling-River-EEC.pdf

Full floristic sites (16): GWR1, GWR3, GWR4, GWR5, GWR6, GWR9, GWR11, GWR12, GWR14, GWR15, GWR16, GWR17, GWR19, GWR21, GWR24, GWR30. Plate 1.

Environmental relationships: restricted to creek lines.

Structure: highly variable but predominantly a layered forest, shrubby woodland, woodland, closed scrub or closed shrubland.

No. of taxa: 151.

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Eucalyptus camaldulensis*, *Casuarina cunninghamiana*, *Angophora floribunda*, *Callitris glaucophylla*, *Brachychiton populneus*.

Tall shrubs: *Callistemon viminalis*, *Melaleuca bracteata*, *Geijera parviflora*, *Alphitonia excelsa*, *Melia azederach*.

Shrubs: *Notelaea microcarpa*, *Bursaria spinosa*, *Hibbertia obtusifolia*, *Dodonaea viscosa* var. *angustifolia*, *Acacia implexa*, *Acacia leiocalyx*, *Phyllanthus subcrenulatus*, *Carissa ovata*, *Abutilon oxycarpum*, *Acacia deanei*, *Psyrax odoratum*, *Pimelea neo-anglica*.

Climbers & trailers: *Commelina cyanea*, *Desmodium varians*, *Glycine tabacina*, *Jasminum suavissimum*, *Jasminum lineare*.

Ground cover: *Microlaena stipoides*, *Austrostipa verticillata*, *Carex inversa*, *Cyperus gracilis*, *Cynodon dactylon*, *Oplismenus aemulus*, *Echinopogon ovatus*, *Rumex brownii*, *Poa sieberiana*, *Oxalis perennans*, *Urtica incisa*, *Dichondra* sp. A, *Phyllanthus virgatus*, *Wahlenbergia communis*, *Urochloa foliosa*, *Einadia hastata*, *Echinopogon caespitosus*, *Aristida personata*, *Ajuga australis*, *Dichelachne micrantha*, *Cymbopogon refractus*, *Carex inomitata*, *Boerhavia dominii*, *Sporobolus creber*, *Sida corrugata*, *Portulaca filifolia*, *Malvastrum coromandelianum*, *Juncus usitatus*, *Eragrostis parviflora*, *Einadia polygonoides*, *Chloris truncata*, *Bothriochloa bladhii*, *Viola caleyana*, *Sporobolus mitchellii*, *Sporobolus elongatus*, *Senecio quadridentatus*, *Scleria mackaviensis*, *Scleranthus biflorus*, *Schenkia spicata*, *Rytidosperma racemosum* var. *racemosum*, *Portulaca oleracea*, *Marsilea drummondii*, *Lomandra longifolia*, *Geranium solanderi*, *Festuca asperula*, *Einadia nutans*, *Digitaria brownii*.

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Dichondra repens, *Dianella revoluta*, *Chrysocephalum semipapposum*, *Alternanthera denticulata*, *Themeda triandra*, *Swainsona galegifolia*, *Rorippa eustylis*, *Plantago varia*, *Lomandra multiflora*, *Imperata cylindrica*, *Galium migrans*, *Eragrostis leptostachya*, *Eragrostis brownii*, *Digitaria divaricatissima*, *Cynoglossum australe*, *Cheilanthes sieberi*, *Chamaesyce drummondii*, *Centella asiatica*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Tradescantia fluminensis*, *Sida rhombifolia*, *Bidens pilosa*, *Paspalum dilatatum*, *Heliotropium amplexicaule*, *Verbena bonariensis*, *Festuca pratensis*, *Hirschfeldia incana*, *Setaria parviflora*, *Hyparrhenia hirta*, *Pavonia hastata*, *Conyza bonariensis*, *Bidens subalternans*, *Verbena caracasana*, *Gomphocarpus fruticosus*, *Conium maculatum*, *Cirsium vulgare*, *Ciclospermum leptophyllum*, *Solanum nigrum*, *Oxalis brasiliensis*, *Gomphrena celosioides*, *Cyperus aggregatus*, *Argemone ochroleuca*, *Anagallis arvensis*, *Rumex crispus*, *Dactylis glomerata*, *Bromus catharticus*, *Xanthium orientale*, *Prunus persica*, *Paronychia brasiliensis*, *Modiola caroliniana*, *Euphorbia peplus*, *Cyperus eragrostis*, *Alternanthera pungens*, *Xanthium occidentale*, *Phyla canescens*, *Petrorhagia nanteuilii*, *Opuntia stricta*, *Lactuca serriola*, *Hypochaeris radicata*, *Vulpia muralis*, *Verbena gaudichaudii*, *Verbascum virgatum*, *Sonchus oleraceus*, *Rosa rubiginosa*, *Richardia brasiliensis*, *Polygonum aviculare*, *Opuntia aurantiaca*, *Lepidium africanum*, *Lamium amplexicaule*, *Gamochaeta purpurea*, *Ficus carica*, *Eragrostis curvula*, *Bromus diandrus*, *Bromus brevis*, *Aira cupaniana*.

Per cent of species introduced: 37%

Notes & conservation status: all of this community falls within the Endangered Aquatic community in the Natural Drainage System of the Lowland Catchment of the Darling River which includes the north-western slope rivers including the Gwydir River from Copeton Dam downstream and including the main channels and tributaries such as all natural creeks, streams and associated floodplains. This determination also encompasses deep channels, deep pool areas, suspended load depositional 'benches', higher floodplain 'benches', braided channels, gravel beds and riffle zones.. Implicit in this determination is the protection of associated vegetation to enable the persistence of the aquatic community that depends upon it. Key threats to this endangered aquatic community include any man-made structures, alteration of flow (such as water extraction), removal of vegetation, sedimentation, insecticide runoff, overfishing, removal of snags, introduction of aquatic and streamside introduced pests and changes in nutrient loads. Degradation of riparian vegetation along NSW waterways is a listed Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*. *Melaleuca bracteata* is the most widely distributed species of *Melaleuca* and occurs from the central western slopes of NSW up to Cape York in Queensland with some occurrences within central Australia and in the Kimberley. It is generally restricted to altitudes between 50 to 550 m and

Gwydir River

rainfalls between 250-1150 mm but has no particular preference to soils. This species is one the most common and conspicuous co-dominants in this community. It is slow growing and generally is as tall as 10 m though may grow to 20 m. In broad terms this assemblage type occurs though out the north western slopes and into western south east Queensland. What is known in reserves is a very small percentage of the total coverage and is in most situations highly disturbed or invaded by exotic species. This community should be considered as poorly reserved across its range and much that is reserved being of poor quality. *Eucalyptus camaldulensis* is the most widespread eucalypt within Australia and has no particular soil preferences and generally forms pure stands but more commonly forms ecotonal associations with other watercourse taxa such as *Casuarina cunninghamiana* and *Melaleuca bracteata* within this region and with other woodland species that adjoin the creek banks such as *E. melliodora* and *Angophora floribunda* as is seen here.

Gwydir River



Plate 1: Photograph of Community 1.

Gwydir River

3.1.2 Rough-barked Apple (*Angophora floribunda*) – Yellow Box (*Eucalyptus melliodora*) – White Cypress Pine (*Callitris glaucophylla*) Grassy Woodland

TSC Act: White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological
Community *in part*.

<http://www.environment.nsw.gov.au/determinations/BoxgumWoodlandEndComListing.htm>

EPBC Act: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native
Grassland *in part*.

<http://www.environment.gov.au/cgi->

[bin/sprat/public/publicshowcommunity.pl?id=43&status=Critically%20Endangered](http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=43&status=Critically%20Endangered)

Full floristic sites (3): GWR8, GWR13, GWR36. Plate 2.

Environmental relationships: restricted to upper benches particularly in the south of the study
region around Little Bora.

Structure: highly variable but predominantly a layered woodland, grassy woodland, woodland, low
open woodland or grassland.

No. of taxa: 57.

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Angophora floribunda*, *Eucalyptus melliodora*, *Callitris glaucophylla*, *Eucalyptus camaldulensis*.

Tall shrubs: *Geijera parviflora*.

Shrubs: *Maireana microphylla*, *Notelaea microcarpa*, *Bursaria spinosa*.

Climbers & trailers: *Commelina cyanea*.

Ground cover: *Austrostipa verticillata*, *Cyperus gracilis*, *Calotis lappulacea*, *Oxalis perennans*, *Einadia
hastata*, *Crinum flaccidum*, *Austrostipa scabra*, *Aristida personata*, *Wahlenbergia communis*, *Urtica
incisa*, *Rytidosperma racemosum* var. *racemosum*, *Rumex brownii*, *Poa sieberiana*, *Microlaena
stipoides*, *Echinopogon ovatus*, *Digitaria divaricatissima*, *Dichondra* sp. A, *Dichelachne micrantha*,
Bothriochloa macra, *Vittadinia cuneata*, *Senecio quadridentatus*, *Malvastrum coromandelianum*,
Dichanthium sericeum, *Chrysocephalum semipapposum*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Heliotropium amplexicaule*, *Cyperus aggregatus*, *Petrorhagia nanteuillii*, *Conyza
bonariensis*, *Oenothera rosea*, *Lactuca serriola*, *Ciclospermum leptophyllum*, *Setaria parviflora*,
Pavonia hastata, *Opuntia aurantiaca*, *Hirschfeldia incana*, *Tradescantia fluminensis*, *Paspalum
dilatatum*, *Lepidium bonariense*, *Ammi majus*, *Solanum nigrum*, *Sida rhombifolia*, *Festuca pratensis*,

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Cirsium vulgare, *Centaurea solstitialis*, *Bromus inermis*, *Bromus brevis*, *Bidens subalternans*, *Bidens pilosa*.

Per cent of species introduced: 42%

Notes & conservation status: this community is often derived grassland along the road verge probably originally a grassy woodland type with *Eucalyptus melliodora* (Yellow Box), *Angophora floribunda* (Rough-barked Apple) with at times *Eucalyptus camaldulensis* (River Red Gum) and on rockier ground and steeper slopes intergrades with *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Eucalyptus dealbata* (Tumbledown Gum). This community potentially had scattered shrubs but is likely to have been what could have been termed a Box Gum Grassy Woodland. The understorey is, unfortunately, in some areas largely exotic in terms of cover and with the addition of the removal of the overstorey would mean that such areas fall outside of the Threatened Community determinations. Control of weeds would cause the recovered stands to fall within the TEC determinations. However there are stands that include largely native understorey and also remnant trees and thus would fall within the determinations as an endangered community. An assessment under the EPBC Act would require the placement of plots of a 20 x 50 m size which is larger than those used for this mapping program. In this broad sense this type of assemblage is common along the western side of the tablelands and along the slopes from over the Queensland border south to northern Victoria. These type of Grassy Box-Gum woodlands are usually the most intensively used all of this community would conform to the **endangered** Box – Gum Woodland on the TSC Act and the **endangered** White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grasslands of the EPBC Act.

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Plate 2: Photograph of Community 2.

Gwydir River

3.1.3 White Cypress Pine (*Callitris glaucophylla*) – Silver-leaved Ironbark (*Eucalyptus melanophloia*) – White Box (*Eucalyptus albens*) Shrubby Woodland

Full floristic sites (6): GWR2, GWR10, GWR18, GWR22, GWR25, GWR37. Plate 3.

Environmental relationships: occurs predominantly on steeper slopes beside the floodplain.

Structure: highly variable but predominantly a layered forest, shrubby woodland, woodland, closed scrub or closed shrubland.

No. of taxa: 109.

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Callitris glaucophylla*, *Eucalyptus melanophloia*, *Eucalyptus albens*, *Eucalyptus melliodora*, *Eucalyptus camaldulensis*.

Tall shrubs: *Geijera parviflora*, *Brachychiton populneus*.

Shrubs: *Notelaea microcarpa*, *Carissa ovata*, *Acacia leiocalyx*, *Abutilon oxycarpum*, *Cassinia quinquefaria*, *Dodonaea viscosa* var. *angustifolia*, *Acacia deanei*, *Maireana microphylla*, *Acacia implexa*, *Acacia decora*, *Spartothamnella juncea*, *Solanum amblymerum*, *Pimelea neo-anglica*, *Olearia elliptica*, *Bursaria spinosa*, *Breynia cernua*, *Beyeria viscosa*.

Climbers & trailers: *Jasminum lineare*, *Clematis microphylla*, *Glycine tabacina*, *Desmodium varians*, *Commelina cyanea*.

Ground cover: *Carex inversa*, *Austrostipa verticillata*, *Microlaena stipoides*, *Dichondra* sp. A, *Dichelachne micrantha*, *Cyperus gracilis*, *Rytidosperma racemosum* var. *racemosum*, *Oxalis perennans*, *Einadia nutans*, *Cymbopogon refractus*, *Wahlenbergia communis*, *Rostellularia adscendens*, *Einadia polygonoides*, *Dichanthium sericeum*, *Malvastrum coromandelianum*, *Cheilanthes sieberi*, *Calotis lappulacea*, *Boerhavia dominii*, *Sigesbeckia australiensis*, *Hibiscus sturtii*, *Daucus glochidiatus*, *Chloris truncata*, *Brunoniella australis*, *Vittadinia dissecta*, *Panicum simile*, *Glossocardia bidens*, *Geranium solanderi*, *Eriochloa pseudoacrotricha*, *Eragrostis leptostachya*, *Eragrostis elongata*, *Einadia hastata*, *Echinopogon ovatus*, *Digitaria divaricatissima*, *Chrysocephalum semipapposum*, *Calotis cuneifolia*, *Austrostipa scabra*, *Ajuga australis*, *Zornia dyctiocarpa*, *Vittadinia muelleri*, *Urtica incisa*, *Tricoryne elatior*, *Schenkia spicata*, *Phyllanthus virgatus*, *Marsilea drummondii*, *Lomandra multiflora*, *Galium migrans*, *Euchiton sphaericus*, *Einadia nutans*, *Digitaria brownii*, *Dianella caerulea*, *Desmodium brachypodum*, *Crinum flaccidum*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Verbena bonariensis*, *Sida rhombifolia*, *Conyza bonariensis*, *Bidens subalternans*, *Bidens pilosa*, *Petrorhagia nanteuillii*, *Opuntia aurantiaca*, *Hyparrhenia hirta*, *Setaria parviflora*, *Tradescantia fluminensis*, *Cyperus aggregatus*, *Verbascum virgatum*, *Paspalum dilatatum*,

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Heliotropium amplexicaule, *Cirsium vulgare*, *Solanum nigrum*, *Pavonia hastata*, *Malvastrum americanum*, *Lactuca serriola*, *Verbena caracasana*, *Sonchus oleraceus*, *Schinus areira*, *Paronychia brasiliana*, *Hypochaeris radicata*, *Gomphrena celosioides*, *Ciclospermum leptophyllum*, *Anagallis arvensis*.

Per cent of species introduced: 25%

Notes & conservation status: the understorey of this assemblage is reasonably stable despite some noticeable overstorey changes. Benson *et al.* (1996) describe this as *Eucalyptus melanophloia*, *Eucalyptus albens* and *Callitris glaucophylla* and its type probably restricted to The Peel and Gwydir Valleys. It is very common within the local region and is one of the most common community types within the Bingara State Conservation Areas (Derra Derra and Molroy) and the Gwydir River National Park (Mehi, Noonga, Murchison, Salmon, Munro) and within *Euroka* Nature Conservation Trust property. Within the Terry Hie Hie group of reserves this community is also found within Bullala National Park, Irrigappa Aboriginal Area, Courallie Aboriginal Area, the Mission Aboriginal Area, Berrygill Aboriginal Area and Terry Hie Hie Aboriginal Area. It is common for *Eucalyptus melanophloia* to form mono-dominant stands on soils with a higher clay content. Somewhat similar communities are known to exist at Arakoola NR, Kwiambal NP, Bullala NP, Gunyerwarildi NP and Planchonella NR. Occasionally *Eucalyptus albens* does not occur and *Eucalyptus melanophloia* is dominant or mixed stands of both may co-occur. Beadle (1981) describes *E. albens* as being particularly common on soils with a high base status particularly in calcium and generally of high fertility.

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Plate 3: Photograph of Community 3.

Gwydir River

3.1.4 White Cypress Pine (*Callitris glaucophylla*) – Silver-leaved Ironbark (*Eucalyptus melanophloia*) – Tumbledown Gum (*Eucalyptus dealbata*) Woodland

Full floristic sites (2): GWR20, GWR35. Plate 4.

Environmental relationships: found on steep slopes above the flood prone locations on shallow soils.

Structure: a woodland, shrubby woodland or low open woodland.

No. of taxa: 45.

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Callitris glaucophylla*, *Eucalyptus melanophloia*, *Eucalyptus dealbata*.

Tall shrubs: none apparent.

Shrubs: *Acacia leiocalyx*, *Acacia decora*, *Cassinia quinquefaria*, *Olearia elliptica*, *Notelaea microcarpa*.

Climbers & trailers: *Glycine tabacina*, *Desmodium varians*.

Ground cover: *Aristida personata*, *Wahlenbergia communis*, *Stackhousia muricata*, *Rytidosperma racemosum* var. *racemosum*, *Rostellularia adscendens*, *Poa sieberiana*, *Paspalidium constrictum*, *Oxalis perennans*, *Glossocardia bidens*, *Evolvulus alsinoides*, *Enneapogon nigricans*, *Dichelachne micrantha*, *Dichanthium sericeum*, *Cyperus gracilis*, *Cymbopogon refractus*, *Brunoniella australis*, *Vittadinia muelleri*, *Phyllanthus virgatus*, *Panicum simile*, *Geranium solanderi*, *Einadia trigonos*, *Einadia polygonoides*, *Digitaria brownii*, *Dianella caerulea*, *Crinum flaccidum*, *Chloris truncata*, *Cheilanthes sieberi*, *Carex inversa*, *Auistrostipa scabra*, *Ajuga australis*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Verbascum virgatum*, *Hyparrhenia hirta*, *Cyperus eragrostis*, *Petrorhagia nanteuilii*, *Gomphocarpus fruticosus*.

Per cent of species introduced: 11%

Notes & conservation status: this is variant of Community 3 that occurs on rockier and drier slopes.

The notes for Community 3 are pertinent here also.

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Plate 4: Photograph of Community 4.

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3.1.5 Silver-leaved Ironbark (*Eucalyptus melanophloia*) – Quinine Bush (*Alstonia constricta*) – Wilga (*Geijera parviflora*) Semi-evergreen Vine Thicket

TSC Act: Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions
- Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act

<http://www.environment.nsw.gov.au/determinations/semievergreen36a.htm>

EPBC Act: Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

<http://www.environment.gov.au/biodiversity/threatened/communities/sevt.html>

Full floristic sites (5): GWR23, GWR28, GWR29, GWR33, GWR34. Plate 5.

Environmental relationships: generally on higher nutrient soils on upper slopes above the flood prone locations, sometimes on rocky slopes.

Structure: semi-evergreen vine thicket, dry rainforest, low shrubby woodland.

No. of taxa: 76

No. of taxa per plot: 29-34-39.

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Eucalyptus melanophloia*, *Callitris glaucophylla*, *Eucalyptus crebra*, *Angophora floribunda*, *Brachychiton populneus*.

Tall shrubs: *Alstonia constricta*, *Geijera parviflora*, *Alphitonia excelsa*, *Alectryon subdentatus*, *Exocarpos cupressiformis*.

Shrubs: *Carissa ovata*, *Notelaea microcarpa*, *Dodonaea viscosa* var. *angustifolia*, *Acacia leiocalyx*, *Breynia cernua*, *Abutilon oxycarpum*, *Psyrax odoratum*, *Cassine australis*, *Spartothamnella juncea*, *Cassinia quinquefaria*, *Solanum parvifolium*, *Pimelea neo-anglica*, *Acacia implexa*, *Acacia decora*, *Solanum amblymerum*, *Phyllanthus carpentariae*, *Olearia elliptica*, *Beyeria viscosa*, *Acacia deanei*.

Climbers & trailers: *Jasminum lineare*, *Desmodium varians*, *Clematis microphylla*, *Parsonsia eucalyptophylla*, *Marsdenia viridiflora*, *Glycine tabacina*, *Eustrephus latifolius*.

Ground cover: *Austrostipa scabra*, *Paspalidium constrictum*, *Microlaena stipoides*, *Cheilanthes sieberi*, *Einadia hastata*, *Scleria mackaviensis*, *Cymbopogon refractus*, *Cheilanthes distans*, *Urochloa foliosa*, *Einadia nutans*, *Cyperus gracilis*, *Carex inversa*, *Brunoniella australis*, *Austrostipa verticillata*, *Urtica incisa*, *Rytidosperma racemosum* var. *obtusatum*, *Phyllanthus virgatus*, *Panicum simile*, *Lomandra multiflora*, *Hibiscus sturtii*, *Enneapogon gracilis*, *Einadia polygonoides*, *Dichondra* sp. A,

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Calotis lappulacea, *Boerhavia dominii*, *Aristida personata*, *Wahlenbergia communis*, *Vittadinia sulcata*, *Veronica calycina*, *Rostellularia adscendens*, *Galium propinquum*, *Arthropodium milleflorum*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Hyparrhenia hirta*, *Bidens subalternans*, *Bidens pilosa*, *Opuntia aurantiaca*, *Verbena bonariensis*, *Pavonia hastata*, *Heliotropium amplexicaule*.

Per cent of species introduced: 9%

Notes & conservation status: this community in most instances would fall within the TSC Act determination of Semi-evergreen Vine Thicket whose characteristic species include a canopy of *Cassine australis*, *Geijera parviflora*, *Notelaea microcarpa* with an emergent overstorey of *Eucalyptus albens*, *Eucalyptus melanophloia* and *Callitris glaucophylla* with associated species such as *Alectryon subdentatus*, *Alstonia constricta*, *Aristida ramosa*, *Beyeria viscosa*, *Boerhavia dominii*, *Psyrax oleifolium*, *Carissa ovata*, *Cheilanthes sieberi*, *Dichondra repens*, *Dodonaea viscosa*, *Indigofera brevifolius*, *Pandorea pandorana*, *Parsonsia eucalyptophylla*, *Phyllanthus subcrenatus*, *Pimelea neo-anglica*, *Spartothamnella juncea* and *Thellungia advena*. Out of a these 23 characteristic species 19 were found within this community. The TSC Act determination is included within the Federal EPBC Act determination of Semi-evergreen Vine Thickets. This type of floristic assemblage occurs predominantly within the North Western Slopes of New South Wales. Semi-evergreen vine thicket (SEVT) is a type of rainforest that occurs on the North West Slopes of New South Wales, extending north from the Liverpool Range through southern and central Queensland to areas inland of Townsville. Outliers also occur in the upper Hunter Valley of NSW, near Scone. Vine thicket has the structural (when best developed a dense, often closed canopy) and floristic (plant species composition) characteristics of rainforest, but because of its low height (generally 4-9 m) it cannot be considered to be forest (Curran, *pers. comm.*). Floyd (1990) places these communities within his Sub-alliance No. 32 *Notelaea microcarpa* – *Ehretia membranifolia* – *Geijera parviflora* for his rainforest classification of New South Wales and includes vegetation as far south as the Hunter valley and north to Toowoomba. Floyd (1990) suggests that for optimal development of this community type rainfall is around 575-650 mm. A coastal origin is speculated for dry rainforests of Australia. Cannon *et al.* (2003) describe and map SEVT from as far west as Bellata with major occurrences north of Caroda.

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Plate 5: Photograph of Community 5.

Gwydir River

3.1.6 White Cypress Pine (*Callitris glaucophylla*) – River Red Gum (*Eucalyptus melanophloia*) Gravel Bed Woodlands, Grasslands and Herbfields

Fisheries Act: Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River

http://www.dpi.nsw.gov.au/data/assets/pdf_file/0010/208297/FR22-Darling-River-EEC.pdf

Full floristic sites (4): GWR7, GWR26, GWR31, GWR32. Plate6.

Environmental relationships: restricted to old bench gravel beds.

Structure: highly variable but predominantly an open grassland or herbfield but at times it may be a open shrubland or low open shrubby woodland.

No. of taxa: 56

Most common natives: listed in order of decreasing summed cover scores (fidelity x cover).

Trees: *Callitris glaucophylla*, *Eucalyptus camaldulensis*.

Shrubs: *Hibbertia obtusifolia*, *Acacia leiocalyx*, *Xanthorrhoea johnsonii*, *Dodonaea viscosa* var. *angustifolia*, *Breynia cernua*, *Acacia decora*.

Climbers & trailers: *Glycine tabacina*, *Clematis microphylla*.

Ground cover: *Aristida holathera*, *Wahlenbergia communis*, *Indigofera linnaei*, *Portulaca pilosa*, *Tripogon loliiformis*, *Themeda triandra*, *Dichanthium sericeum*, *Cymbopogon refractus*, *Calotis lappulacea*, *Portulaca filifolia*, *Phyllanthus virgatus*, *Evolvulus alsinoides*, *Cyperus gracilis*, *Cheilanthes distans*, *Carex inversa*, *Boerhavia dominii*, *Austrostipa scabra*, *Wahlenbergia gracilentia*, *Swainsona galegifolia*, *Sporobolus creber*, *Rytidosperma racemosum* var. *obtusatum*, *Paspalidium constrictum*, *Panicum simile*, *Glossocardia bidens*, *Galium migrans*, *Enneapogon nigricans*, *Digitaria divaricatissima*, *Digitaria ammophila*, *Dichondra* sp. A, *Cheilanthes sieberi*, *Aristida personata*, *Ajuga australis*.

Taxa of conservation importance: none apparent.

Introduced taxa: *Verbascum virgatum*, *Hyparrhenia hirta*, *Heliotropium amplexicaule*, *Bidens subalternans*, *Gomphocarpus fruticosus*, *Verbena bonariensis*, *Opuntia aurantiaca*, *Gomphrena celosioides*, *Cyperus aggregatus*, *Bidens pilosa*, *Opuntia stricta*, *Cyperus eragrostis*, *Argemone ochroleuca*, *Anagallis arvensis*.

Per cent of species introduced: 25%

Notes & conservation status: all of this community falls within the Endangered Aquatic community in the Natural Drainage System of the Lowland Catchment of the Darling River which includes the

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north-western slope rivers including the Gwydir River from Copeton Dam downstream and including the main channels and tributaries such as all natural creeks, streams and associated floodplains. This determination also encompasses deep channels, deep pool areas, suspended load depositional ‘benches’, higher floodplain ‘benches’, braided channels, gravel beds and riffle zones.. Implicit in this determination is the protection of associated vegetation to enable the persistence of the aquatic community that depends upon it. Key threats to this endangered aquatic community include any man-made structures, alteration of flow (such as water extraction), removal of vegetation, sedimentation, insecticide runoff, overfishing, removal of snags, introduction of aquatic and streamside introduced pests and changes in nutrient loads. Degradation of riparian vegetation along NSW waterways is a listed Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*. Gravel beds are a very floristically understudied environment and their floristic conservation status is not fully understood as they are often missed during surveys or are lumped within broader riparian associations. These gravel beds often contain an unusual assortment of species and at times may have their own specialist flora species.



Plate 6: Photograph of Community 6.

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3.2 Threatened Species (TS) and Ecological Communities (TEC)

None of the species listed within Table 1 were found during this current investigation and no other threatened flora species were found at the time of this current survey.

Three listed Threatened Ecological Communities were found within the study site and these entities covered 75% of the area mapped (Figure 4). The most extensive was 'Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River' from the Fisheries Act which includes the Gwydir River and its tributaries below Copeton Dam. Quality of stands is not used as a criterion for determining this community and it is based on landform. Thus even degraded sites would be included within this listed entity. Implicit in this determination is the protection of associated vegetation and habitat features such as dead timber and floodplain bank and channel integrity. The uncontrolled visitor activity along the river by visitors are in conflict with this determination.

'Semi-evergreen Vine Thickets' are listed on both the *TSC* and *EPBC* Acts as an endangered ecological community. This community was found in slightly more elevated locations particularly closer to the township of Bingara. This community, as it was further upslope from the floodplain and was also often on steeper sites has been less impacted by visitor activities. However locally some tracks do pass through this community or along its boundaries, firewood collection has occurred and some roadside fires have threatened some locations.

'White Box Yellow Box – Blakely's Red Gum Woodland and derived grassland' is a listed endangered community on both the *TSC* and *EPBC* Acts. This community again occurs on slightly higher elevation sites and is less impacted on by visitor activity. It is however dissected by unofficial tracks that are used by campers and firewood collection has occurred. It is mostly affected by roadside maintenance. There is a quality component to this determination and some locations though it may have contained this community may lay outside of the determination due to a lack of native overstorey and much of the understorey being exotic in origin.

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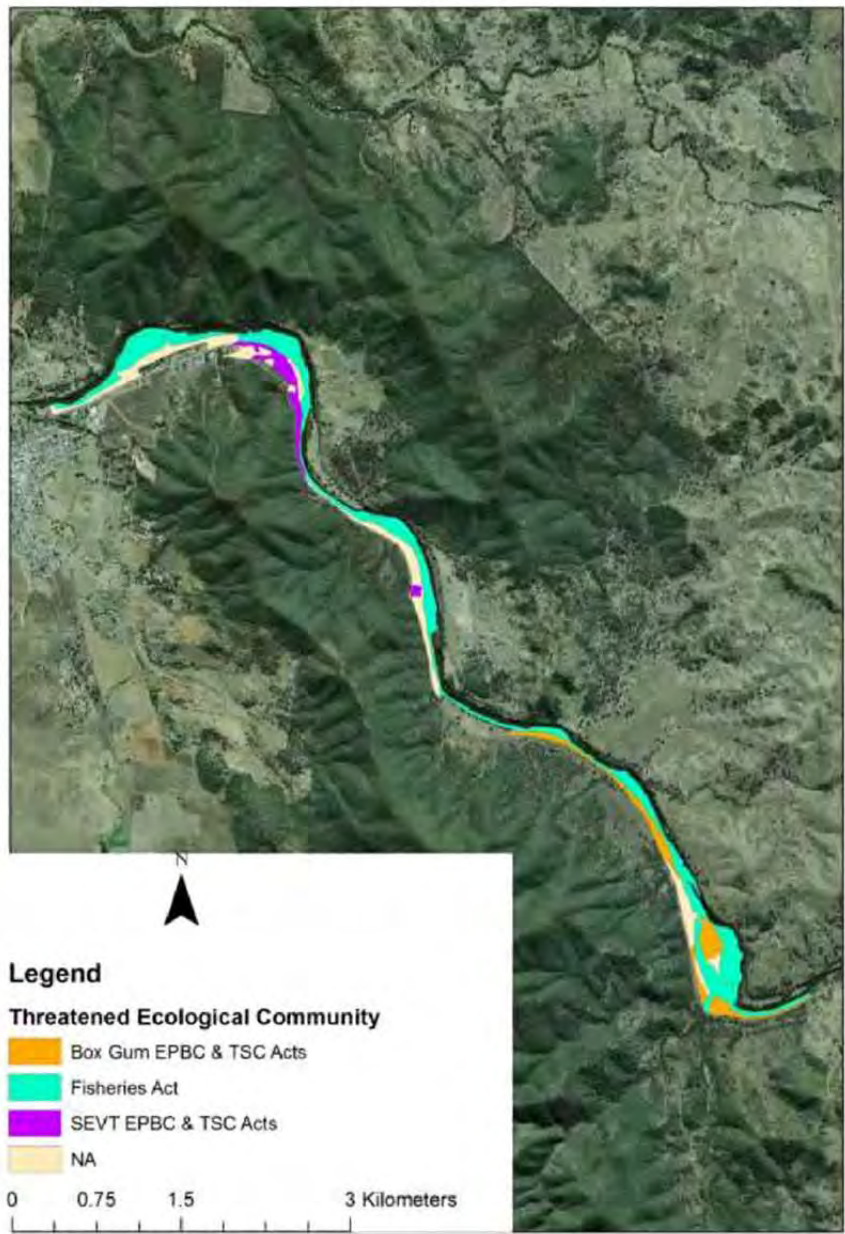


Figure 4: Mapped threatened communities. The listed communities are all high value areas that require protection. NA stands for not applicable (i.e. not a currently listed threatened community). See section 3.2 for explanation of types.

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3.3 Management Issues: Public Usage

There is seasonal but significant public usage of accessible areas of the riverbank particularly for recreational fishing and camping. This is causing many areas of the river, particularly where the floodplain is extended and amenable, to have a number of its ecological processes disrupted and habitat to be downgraded or destroyed. A number of issues arise from such informal usage and include amongst many:

Faecal Pollution

As no toileting facilities are available campers where noted during the survey to use an assortment of makeshift toileting facilities that primarily include toileting tents some of which are only holes in the ground that are roughly covered up. This behaviour over a long period can cause disease and unsanitary water quality. This can lead to disease for both human and local native animals.

Non-native Animals

Campers where seen bringing pets, primarily dogs which were at times unleashed. A wide variety of native animals including common species like possums, kangaroos, wallabies, lizards, birds as well as rare and threatened fauna are at threat from domestic animals. Many native animals are very prone to stress-related diseases. These diseases can be brought on by contact with humans and domestic pets. Unrestrained pets are one of the greatest threats to native wildlife. Over a five year period nearly 17,000 attacks by domestic pets on native birds and animals were recorded by organisations such as WIRES. This number is thought to be only a small number compared to the real coast of attacks as it only reflects those brought in alive to rescuers. Recent research in the outer native vegetation areas around Brisbane is showing that the presence of walked dogs causes native birds to abstain from nesting within a 200 m zone around such walking areas. The presence of non-native animals at bush campsites will deter the breeding of native animals.

Rubbish

Rubbish was not seen as a major problem during the current survey though it was noticed at a number of locations. Rubbish however does also include food scraps and its use by native animals is often detrimental causing dietary diseases. Much rubbish is likely to flow downstream during high water periods.

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Firewood

Firewood collection was noted to have occurred in all areas where campsites were common. These zones showed a total denudation of any on ground woody material nor where dead standing trees seen in areas where public usage was high. Even small woody debris were cleared from areas of high camper usage. Larger fallen trunks were seen to have been very recently cut by chainsaw. Fallen timber is a key habitat feature that provides shelter for reptiles, frogs, small mammals and numerous invertebrates. Reptile abundance and richness has been correlated with the percentage cover of logs, their number and length. Logs provide basking sites for reptiles as well as shelter, foraging and nesting locations. Survival of some animal populations is reliant of the refuges supplied by logs. Logs allow animals to hide from predatory species and also allow fauna to move through the landscape making less noise. Fallen dead wood provides important habitat for many invertebrate species that depend on decaying wood for their survival and which play an important role in nutrient cycling. Fallen wood provides a number of types of habitat for a variety of organisms including microbial species and fungi which are an important food source for many invertebrates and some vertebrates. Loss of fallen logs changes the ground microclimate which affect soil organisms below fallen logs as well as changing the above ground plant cover. The removal of dead wood and dead trees is listed as a key threatening process. Dead standing trees supply the future resource for fallen dead timber. Standing dead trees are also important as they often contain hollows and 290 vertebrate species are reliant on hollows, many obligately so. Removal of dead wood can cause broad scale changes to woodlands and forests

Noise

Many native animals are highly prone to stress and can die from excessive stress. This can occur from human generated noise and machinery movement. This is particularly so during peak holiday periods and during night time when both noise and light can cause disturbance.

Clearing

While large scale clearing is not occurring many small scale clearing events happen each time a camp is set. This includes 'tidying up' such as flattening of grounds for tents, associated equipment and for campfires. These small events are at times minor and recoverable however areas which are more commonly used have little time for proper recovery leaving such sites prone to weed invasion and establishment.

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Braiding of Tracks

This is one of the most damaging processes within the study area. An unofficial extensive system of tracks occurs throughout the whole site. These tracks have been formed to allow access to favourite camping or fishing locations along the river. Due to tracks being at times too wet/muddy for some vehicles to pass braiding has occurred.. Braiding of tracks causes extensive damage and is a main route through which exotic plants are spread more extensively. Tracks also cause soil compaction and surfaces to become hard and impenetrable for native species. Tracks also cause increased erosion. Tracks are a form of clearing of native vegetation. The current extensive track system and increase in size should be considered as one of the greater threats to biodiversity along the river.

Weeds

In most instances introduced plants require some for of disturbance or modification of the environment such as an increase in nutrients to become established. The extensive use of the river bank means that this is occurring at a very high rate due to many factors. Currently 17% of the flora of NSW is exotic in origin overall 25% of the species found were exotic. One community had 42% of its listed species as non-natives. This survey was conducted only during a single time of year and many other species may be present that were not recorded. Weed species will be promoted by nutrient addition from dumping of food scraps and toileting, cars both being trapped in dry form and on mud on vehicles and promoted by clearing activities including 'tidying up' and firewood collection. Some weed taxa are essentially ubiquitous and do not displace native taxa such as *Hypochaeris radicata* others require constant disturbance to become established. There are a number of weedy taxa that are likely to cause serious environmental problems and loss of diversity if left unchecked and these include taxa such as *Hyparrhenia hirta* (Coolatai Grass), *Eragrostis curvula* (African Lovegrass), *Phyla canescens* (Lippia) and *Tradescantia fluminensis* (Wandering Dew; Plate 7) just to name a few. Some of these species are listed as Key Threatening Processes on the TSC Act.

Cold Water Release

Water of a deep reservoir typically stratifies and often contains a large volume of cold, oxygen poor water. The release of this water to maintain irrigation for properties further down the catchment can cause severe adverse impacts on all downstream ecosystems including natural fish populations. The ecology of the Gwydir River evolved over millennia to

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depend on the flow regimes and water temperatures associated with the natural system. The attenuation of floods and the release of cold water on demand from irrigators can seriously affect these evolved associations. This is termed ‘cold-water pollution’. Cold-water pollution is one of the key factors behind the reduction in the range and abundance of native freshwater fish in New South Wales. Natural temperatures of rivers can be depressed by 8-12 degrees centigrade in spring and summer; annual temperature ranges can be reduced and summer peaks in temperature can be delayed. These changes in temperature can affect many hundreds of kilometres of river downstream causing death of juvenile native fish and reduction in the growth rates of those that survive. Evidence suggests that similar negative effects also occur in the reproductive cycles of turtles and frogs. A study within the Burrendong Dam region showed that 100% survival of fish in warm channels was reduced to only 25% survival in cold channels, furthermore the fish in warmer channels grow significantly better than the survivors in the cold channels. Fish do not breed if the conditions are unfavourable and therefore cold-water release at the wrong time can completely halt breeding of some fish species, or cause them to breed late in the season causing fish eggs to fail to hatch. Furthermore low water temperature can delay or prevent the development of zooplankton blooms which are a necessary food source for fish. Lack of natural seasonal temperature fluctuations have also been found to reduce the number of macroinvertebrates and that their eggs fail to develop. The waters released also usually contain little sediment which precipitates out in the still waters of the dam. These sediments are crucial to flora and fauna of the river below the dams. Large amounts of nutrients that traditionally flowed down the river that formed an essential part of the food-chain are trapped behind the dam wall.



Plate 7: Understorey dominated by the introduced species *Tradescantia fluminensis*.

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Table 2: Listed threatening processes that may impact on the vegetation mapped.

Entity	Type	Status
<i>Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands</i>	Habitat change/loss	TSC Key Threatening Process
<i>Bushrock Removal</i>	Habitat change/loss	TSC Key Threatening Process
<i>Predation by the Feral Cat <i>Felis catus</i> (Linnaeus, 1758)</i>	Pest Animal	TSC Key Threatening Process
<i>Removal of dead wood and dead trees</i>	Habitat change/loss	TSC Key Threatening Process
<i>High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition</i>	Habitat change/loss	TSC Key Threatening Process
<i>Predation by the European Red Fox <i>Vulpes vulpes</i> (Linnaeus 1758)</i>	Pest Animal	TSC Key Threatening Process
<i>Invasion of native plant communities by exotic perennial grasses</i>	Weed	TSC Key Threatening Process
<i>Clearing of native vegetation</i>	Habitat change/loss	TSC Key Threatening Process
<i>Loss of hollow-bearing trees</i>	Habitat change/loss	TSC Key Threatening Process
<i>Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants</i>	Weed	TSC & EPBC Key Threatening Process
<i>The removal of large woody debris from NSW rivers and streams</i>	Habitat change/loss	NSW Fisheries management Act
<i>The degradation of native riparian vegetation along NSW water courses</i>	Habitat change/loss	NSW Fisheries management Act
<i>In-stream structures and other mechanisms that alter natural flow</i>	Habitat change/loss	NSW Fisheries management Act

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4. Management Suggestions

Management of this location is extremely difficult. There is no current regulation of visitor usage except for signage on the type and number of fish that may be caught. The study area is very long and narrow and as such has a high edge to area ratio. Any location that can allow access to vehicles has tracks and entry to the river side occurs at numerous locations. In addition a Telstra line with its associated access track occurs along the entire length of the area investigated between the river and the Bingara/Copeton Road. Some control needs to occur as significant environmental change has already occurred. However it is acknowledged that extensive changes to visitor activity would both be costly and also likely to cause backlash from those used to doing as they have in the past. It is recognised that riverside camping is important for the local economy. However its unchecked usage is likely to cause the river side to be 'loved to death'. By their very nature recreational activities often contribute to the decline of the environment that attracts people in the first place. It is important that any management activities ensure a balance between the conflicting interests of visitors and the environment they come to visit. A sustainable recreation strategy needs to be put into place that incorporates the restoration of existing degraded sites and the prevention of further damage and the planning for recreation areas and allowable activities. Effective sustainable recreation requires managing visitor behaviour, partnership with the community and long-term commitment from government. It is understood that any improvements or capital works on the site implies a duty of care by council and that this will need to be taken into consideration when management actions are being considered. For this reason education and behaviour modification may be the most appropriate methods available to council. However, for long term and continued improvement some on ground improvements and capital works are likely to be required in the long term.

It is suggested that a strategy be implemented that is both progressive and adaptive due to local concerns. Some suggested management actions that may be considered include:

- A survey of visitor type and characteristics. Where are these visitors from, their type of camping styles and what they have chosen this location. A better understanding of visitor type and requirements will better enable appropriate targeting of facilities or management actions. A survey may also include reactions to suggested management actions. Surveys probably need to be on-going to assess usage change and what is and isn't working with changes imposed.

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- Any development within threatened communities including along within the floodplain area (Fisheries Act) will require consent.
- Identification of major stakeholders.
- A public information program using local newspapers, council newsletters, flyers, web site development, presentations to local based associations and clubs and education packages for local schools. Such information should include the importance of the river environment and also what may occur if continued degradation occurs. Such programs should include guidance to recreation users about current and potential impacts of various types of activities and mitigating actions. The programs should encourage behavioural change and engender a stewardship approach to the river side and its environment.
- Records kept of visitor numbers and season of visitation.
- Placement of garbage disposal points. Particularly during high visitation periods. This may include the temporary placement of skips.
- A survey of worse affected areas by weeds. Prioritisation and weed management plan. Not all weeds will need control, some locations are likely to be too far gone for appropriate actions to be taken however some weeds or locations maybe manageable.
- Signage on issues or good camping practice/rules of usage/codes of conduct. Potential introduction of fines for significant breaches if allowable. Placement of signage will allow visitors to become aware of appropriate behaviour and will minimise ecological damage and maximise long term sustainability. It is frequently the lack of behaviour that causes inappropriate behaviour.
- Control of track usage. Though a difficult issue this is highly important. This may include passive means such as signage and education but is likely to require blocking of some tracks and their rehabilitation.
- Rehabilitation of some locations and no access zones. This may involve passive means such as signage and education or blocking of access.
- Regulation of camping zones. Camping should be restricted to designated areas. This allows impacts to be managed, facilities to be targeted and areas to be rehabilitated with removal of visitor impact. Zones should be designated for recreation use, rehabilitation, weed control and environmentally sensitive areas. Camping zones may need to be rotated.
- Provision of firewood either via council placement of the allowance or promotion of local groups or individuals to provide this service.
- Continued evaluation of actions.

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- Investigation of areas of potential best areas of public usage (e.g. Sunnyside) and review of weather usage should be maintained in a single location or moved at times to allow recovery.
- Suggested methods to reduce cold-water pollution include:
 - Artificial de-stratification by mechanical mixing of the water column
 - Surface water pumps
 - Trunnions (pipes hinged at the outlet so that the free end can be position to draw water from different levels in the water column).
 - Draft tube mixers
 - Submerged curtains
 - Stilling basins

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**Appendix A: Checklist of flora species noted within the
study area**

* denotes introduced taxa. Note: this represent only opportunistic recordings and species found
within flora survey sites it is not a comprehensive list of species from the site.

Fern & Fern Allies

Adiantaceae

Cheilanthes distans (R.Br.) Mett. Hairy Rock Fern

Cheilanthes sieberi Kunze

subsp. *sieberi* Narrow Rock Fern

Marsileaceae

Marsilea drummondii A.Braun. Common Nardoo

Gymnosperm

Cupressaceae

Callitris glaucophylla Joy Thomps. & L.A.S.Johnson White Cypress Pine

Pinaceae

**Pinus radiata* D.Don Radiata Pine

Monocotyledon

Amaryllidaceae

Crinum flaccidum Herb. Darling Lily, Macquarie Lily

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Anthericaceae

- Arthropodium milleflorum* (DC.) J.F.Macbr.....Vanilla Lily
Tricoryne elatior R.Br.....Yellow Autumn-lily

Commelinaceae

- Commelina cyanea* R.Br.....Scurvy Weed
**Tradescantia fluminensis* Vell.....Wandering Jew

Cyperaceae

- Carex inomitata* K.R.Thiele.....Sedge
Carex inversa R.Br.....Knob Sedge
**Cyperus aggregatus* (Willd.) Endl.....Sedge
**Cyperus eragrostis* Vahl.....Umbrella Sedge
Cyperus gracilis R.Br.....Sedge
Cyperus vaginatus R.Br.....Stiff Flat Sedge
Schoenoplectus validus (Vahl) A.Love & D.Love.....Sedge
Scleria mackaviensis Boeck.....White Head Sedge

Juncaceae

- Juncus usitatus* L.A.S.Johnson.....Common Rush

Lomandraceae

- Lomandra longifolia* Labill.....Spiny-headed Mat-rush

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Lomandra multiflora (R.Br.) Britten

subsp. *multiflora* Many-flowered Mat-rush

Luzuriagaceae

Eustrephus latifolius R.Br. ex Ker Gawl. Wombat Berry

Phormiaceae

Dianella caerulea Sims Rough Flax Lily

Dianella revoluta R.Br.

var. *revoluta* Spreading Flax Lily

Poaceae

**Aira cupaniana* Guss. Silvery Hairgrass

Aristida caput-medusae Domin Many-headed Wiregrass

Aristida holathera Domin

var. *holathera* Erect Kerosene Grass

Aristida personata Henrard Purple Wiregrass

Austrostipa scabra (Lindl.) S.W.L.Jacobs & J.Everett

subsp. *scabra* Rough Speargrass

Austrostipa verticillata (Nees ex Spreng.) S.W.L.Jacobs & J.Everett Slender Bamboo Grass

Bothriochloa bladhii S.T.Blake

subsp. *bladhii* Forest Bluegrass

Bothriochloa macra (Steud.) S.T.Blake Red Grass

**Bromus brevis* Steud. Brome

**Bromus catharticus* Vahl Prairie Grass

**Bromus diandrus* Roth Great Brome

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* <i>Bromus inermis</i> Leyss.	Awnless Brome
<i>Chloris truncata</i> R.Br.	Windmill Grass
<i>Cymbopogon refractus</i> (R.Br.) A.Camus	Barbed Wire Grass
<i>Cynodon dactylon</i> (L.) Pers.	Couch, Bermuda Grass
* <i>Dactylis glomerata</i> L.	Cocksfoot
<i>Dichanthium sericeum</i> S.T.Blake subsp. <i>sericeum</i>	Queensland Bluegrass
<i>Dichelachne micrantha</i> (Cav.) Domin	Short-haired Plumegrass
<i>Digitaria ammophila</i> Hughes.....	Silky Umbrella Grass
<i>Digitaria brownii</i> (Roem. & Schult.) Hughes.....	Cotton Panic Grass
<i>Digitaria divaricatissima</i> (R.Br.) Hughes	Spreading Umbrella Grass
<i>Echinopogon caespitosus</i> C.E.Hubb. var. <i>caespitosus</i>	Tufted Hedgehog Grass
<i>Echinopogon ovatus</i> (G.Forst.) P.Beauv.....	Forest Hedgehog Grass
<i>Enneapogon gracilis</i> (R.Br.) P.Beauv.....	Slender Nineawn
<i>Enneapogon nigricans</i> (R.Br.) P.Beauv.....	Niggerheads
<i>Eragrostis brownii</i> (Kunth) Nees	Brown's Lovegrass
* <i>Eragrostis curvula</i> (Schrud.) Nees.....	African Lovegrass
<i>Eragrostis elongata</i> (Willd.) J.Jacq.....	Clustered Lovegrass
<i>Eragrostis leptostachya</i> Steud.	Paddock Lovegrass
<i>Eragrostis parviflora</i> (R.Br.) Trin.	Weeping Lovegrass
<i>Eriochloa pseudoacrotricha</i> (Stapf ex Thell.) J.M.Black	Early Spring Grass
<i>Festuca asperula</i> Vickery	Graceful Fescue
* <i>Festuca pratensis</i> Huds.....	Meadow Fescue
* <i>Hyparrhenia hirta</i> (L.) Stapf	Coolatai Grass

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<i>Imperata cylindrica</i>	
var. <i>major</i> (Nees) C.E.Hubb	Blady Grass
* <i>Melinis repens</i> (Willd.) Zizka	Red Natal Grass
<i>Microlaena stipoides</i> (Labill.) Druce	
var. <i>stipoides</i>	Weeping Meadow Grass
<i>Oplismenus aemulus</i> (R.Br.) Roem. & Schult.	Creeping Beard Grass
<i>Panicum buncei</i> F.Muell. ex Benth.	Panic
<i>Panicum simile</i> Domin	Two Colour Panic
<i>Paspalidium constrictum</i> (Domin) C.E.Hubb.	Knottybutt Grass
* <i>Paspalum dilatatum</i> Poir.	Paspalum
<i>Phragmites australis</i> (Cav.) Trin ex Steud.	Common Reed
<i>Poa sieberiana</i> Spreng.	Snow Grass
* <i>Rostraria cristata</i> (L.) Tzvelev	Annual Cat's Tail
<i>Rytidosperma racemosum</i>	
var. <i>obtusatum</i> (Benth.) Connor & Edgar	Wallaby Grass
<i>Rytidosperma racemosum</i> (R.Br.) Connor & Edgar	
var. <i>racemosum</i>	Wallaby Grass
* <i>Setaria parviflora</i> (Poir.) Kerguelen	Pigeon Grass
<i>Sporobolus creber</i> De Nardi	Slender Rat's Tail Grass
<i>Sporobolus elongatus</i> R.Br.	Slender Rat's Tail Grass
<i>Sporobolus mitchellii</i> (Trin.) C.E.Hubb. ex S.T.Blake	Rats tail Couch
<i>Themeda triandra</i> Forssk.	Kangaroo Grass
<i>Tripogon loliiformis</i> (F.Muell.) C.E.Hubb.	Five Minute Grass
<i>Urochloa foliosa</i> (R.Br.) R.D.Webster	Leafy Panic
* <i>Vulpia muralis</i> (Kunth) Nees	Fescue

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Xanthorrhoeaceae

Xanthorrhoea johnsonii A.T.Lee.....Grasstree

Dicotyledon

Acanthaceae

Brunoniella australis (Cav.) Bremek.....Blue Trumpet

Rostellularia adscendens (R.Br.) R.M.Barker
subsp. *adscendens*.....Pink Justicia

Amaranthaceae

Alternanthera denticulata R.Br.....Joyweed

**Alternanthera pungens* KunthKhaki-weed

**Gomphrena celosioides* Martius.....Gomphrena Weed

**Guileminea densa* (Schult.) Mog.....Small Mat-weed

Nyssanthes diffusa R.Br.Barbwire Weed

Amygdalaceae

**Prunus persica* (L.) Batsch.....Peach, Nectarine

Anacardiaceae

**Schinus areira* L.....Pepper Tree

Apiaceae

**Ammi majus* L.....Bishop's Weed

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<i>Centella asiatica</i> (L.) Urb.....	Pennywort
* <i>Ciclospermum leptophyllum</i> (Pers.) Sprague.....	Slender Celery
* <i>Conium maculatum</i> L.....	Hemlock
<i>Daucus glochidiatus</i> (Labill.) Fisch., C.A.Mey. & Ave-Lall.....	Native Carrot
* <i>Foeniculum vulgare</i> Mill.	Fennel
Apocynaceae	
<i>Alstonia constricta</i> F.Muell.	Quinine Bush
<i>Carissa ovata</i> R.Br.....	Currant bush
<i>Parsonsia eucalyptophylla</i> F.Muell.	Gargaloo
Asclepiadaceae	
* <i>Gomphocarpus fruticosus</i> (L.) R.Br.	Narrow-leaved Cotton Bush
<i>Marsdenia viridiflora</i> R.Br.....	Native Pear
Asteraceae	
* <i>Bidens pilosa</i> L.	Cobbler's Pegs, Pitchforks
* <i>Bidens subalternans</i> DC.	Greater Beggar's Ticks
<i>Calotis cuneifolia</i> R.Br.	Purple Burr-daisy
<i>Calotis lappulacea</i> Benth.	Yellow Burr-daisy
<i>Cassinia quinquefaria</i> R.Br.....	Rosemary Cassinia
* <i>Centaurea solstitialis</i> L.....	St Barnaby's Thistle
<i>Chrysocephalum semipapposum</i> (Labill.) Steetz	Yellow Buttons
* <i>Cirsium vulgare</i> (Savi) Ten.	Spear Thistle
* <i>Conyza bonariensis</i> (L.) Cronq.	Flaxleaf Fleabane

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<i>Cymbonotus lawsonianus</i> Gaudich.	Bears-ears
* <i>Dittrichia graveolens</i> (L.) Greuter	Stinkwort
<i>Euchiton sphaericus</i> (Willd.) Holub	Cudweed
* <i>Gamochaeta purpurea</i> (L.) Cabrera	Cudweed
<i>Glossocardia bidens</i> (Redtz.) Veldkamp.	Cobbler's Tack
* <i>Hypochaeris radicata</i> L.	Catsear, Flatweed
* <i>Lactuca serriola</i> L.	Prickly Lettuce
<i>Olearia elliptica</i> DC.	Daisy Bush
<i>Senecio quadridentatus</i> Labill.	Cotton Fireweed
<i>Sigesbeckia australiensis</i> D.L.Schulz	Sigesbeckia
* <i>Sonchus oleraceus</i> L.	Common Sowthistle
* <i>Taraxacum officinale</i> Weber	Dandelion
* <i>Torilis nodosa</i> (L.) Gaertn.	Knotted Hedge-parsley
<i>Vittadinia cuneata</i>	
var. <i>hirsuta</i> N.T.Burb.	Fuzzweed
<i>Vittadinia dissecta</i>	
var. <i>hirta</i> N.T.Burb.	New Holland Daisy
<i>Vittadinia muelleri</i> N.T.Burb.	Fuzzweed
<i>Vittadinia sulcata</i> N.T.Burb.	Fuzzweed
* <i>Xanthium occidentale</i> Bertol.	Noogoora Burr, Cockle Burr
* <i>Xanthium orientale</i> L.	Californian Burr
Boraginaceae	
* <i>Buglossoides arvensis</i> (L.) I.M.Johnston	Sheep-weed
<i>Cynoglossum australe</i> R.Br.	Austral Hounds Tongue

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**Heliotropium amplexicaule* Vahl.....Blue Heliotrope

Brassicaceae

**Hirschfeldia incana* (L.) Lagr.-FossatHairy Brassica, Buchan Weed

**Lepidium africanum* (Burman f.) DC.Peppercress

**Lepidium bonariense* L.Peppercress

Rorippa eustylis (F.Muell.) L.A.S.JohnsonRiver Cress

Rorippa laciniata (F.Muell.) L.A.S.JohnsonRiver Cress

Cactaceae

**Opuntia aurantiaca* Lindl.....Tiger Pear

**Opuntia stricta* (Haw.) Haw.

var. *stricta*.....Common Prickly Pear

Campanulaceae

Wahlenbergia communis Carolin.....Tufted Bluebell

Wahlenbergia gracilentia Loth.....Annual Bluebell

Caryophyllaceae

**Cerastium glomeratum* Thuill.....Mouse-ear Chickweed

**Paronychia brasiliensis* DC.....Brazilian Whitlow

**Petrorhagia nanteuilii* (Burnat) P.W.Ball & HeywoodProliferous Pink

**Polycarpon tetraphyllum* (L.) L.....Four-leaved Allseed

Scleranthus biflorus (G.Forst. & Forst.f.) Hook.f.....Knawel

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Casuarinaceae

Casuarina cunninghamiana Miq. River Oak

Celastraceae

Cassine australis (Vent.) Kuntze Red Olive Plum

Chenopodiaceae

Einadia hastata (R.Br.) A.J.Scott Berry Saltbush

Einadia nutans

 subsp. *linifolia* (R.Br.) Paul G.Wilson Climbing Saltbush

Einadia nutans (R.Br.) A.J.Scott

 subsp. *nutans* Climbing Saltbush

Einadia polygonoides (Murr) Paul G.Wilson Fishweed

Einadia trigonos (Roem. & Schult.) Paul G.Wilson Fishweed

Maireana microphylla (Moq.) Paul G. Wilson Eastern Cottonbush

Chloanthaceae

Spartothamnella juncea (A.Cunn. ex Walp.) Briq. Bead Bush

Convolvulaceae

**Cuscuta campestris* Yunk. Golden Dodder

Dichondra repens Forst. & Forst.f. Kidney Weed

Dichondra sp. A. Kidney Weed

Evolvulus alsinoides (L.) L. Evolvulus

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Dilleniaceae

Hibbertia obtusifolia DC.....Grey Guinea Flower

Euphorbiaceae

Beyeria viscosa (Labill.) Miq.....Sticky Spurge

Breynia cernua (Poir.) Muell.Arg.Coffee Bush

Chamaesyce drummondii (Boiss.) D.C.HassallCaustic Weed

**Euphorbia peplus* L.Petty Spurge, Radium Plant

Phyllanthus carpentariae Muell.Arg.Carpentaria Spurge

Phyllanthus subcrenulatus F.Muell.Creek Spurge

Phyllanthus virgatus G.Forst.....Wiry Spurge

Fabaceae

Acacia deanei (R.T.Baker) M.B.Welch, Coombs & McGlynn

subsp. *deanei*.....Green Wattle, Deane's Wattle

Acacia decora Reichb.....Western Golden Wattle

Acacia implexa Benth.Hickory Wattle

Acacia leiocalyx (Domin) Pedley

subsp. *leiocalyx*.....Curracabah

Acacia neriifolia A.Cunn. ex Benth.....Silver Wattle

Acacia paradoxa DC.....Kangaroo Thorn, Thorny Wattle

Desmodium brachypodium A.Gray.....Large Tick Trefoil

Desmodium varians (Labill.) Endl.....Slender Tick Trefoil

Glycine canescens F.J.Herm.Silky Glycine

Glycine tabacina (Labill.) Benth.Variable Glycine

Gwydir River

<i>Indigofera linnaei</i> Ali.....	Birdsville Indigo
* <i>Senna occidentalis</i> (L.) Link.	Coffee Senna
<i>Swainsona galegifolia</i> (Andrews) R.Br.	Smooth Darling Pea
<i>Zornia dyctiocarpa</i> DC.	
subsp. <i>dyctiocarpa</i>	Zornia
Fumariaceae	
* <i>Fumaria muralis</i> Sond. Ex W.Koch.	
subsp. <i>muralis</i>	Wall Fumitory
Gentianaceae	
<i>Schenkia spicata</i> (L.) G.Mans.	Spike Centaury
Geraniaceae	
<i>Geranium solanderi</i> Carolin	
var. <i>solanderi</i>	Native Geranium
Lamiaceae	
<i>Ajuga australis</i> R.Br.	Australian Bugal
* <i>Lamium amplexicaule</i> L.	Dead Nettle
Lauraceae	
* <i>Cinnamomum camphora</i> (L.) Nees.....	Camphor Laurel
Lobeliaceae	
<i>Lobelia purpurascens</i> (R.Br.) E.Wimm.	Whiteroot

Gwydir River

Malvaceae

- Abutilon oxycarpum* (F.Muell.) F.Muell. ex Benth. Straggly Lantern Bush
- Hibiscus sturtii* Hook.
var. *sturtii* Hill Hibiscus
- **Malvastrum americanum* (L.) Torr. Spiked Malvastrum
- Malvastrum coromandelianum* (L.) Garcke Prickly Malvestrum
- **Modiola caroliniana* (L.) G.Don Red-flowered Mallow
- **Pavonia hastata* Cav. Pink Pavonia
- Sida corrugata* Lindl. Corrugated Sida
- **Sida rhombifolia* L. Sida

Martyniaceae

- **Proboscidea louisiana* (Mill.) Thell. Purple-flowered Devil's Claw

Meliaceae

- Melia azederach* L. White Cedar
- Owenia acidula* F.Muell. Gruie Apple, Colane

Menispermaceae

- Stephania japonica*
var. *discolor* (Blume) Forman Snake Vine

Moraceae

- **Ficus carica* L. Fig

Gwydir River

Myrtaceae

<i>Angophora floribunda</i> (Sm.) Sweet	Rough-barked Apple
<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G.Don ex Loudon.....	Weeping Bottlebrush
<i>Eucalyptus albens</i> Benth.....	White Box
<i>Eucalyptus camaldulensis</i> Dehnh.	River Gum, River Red Gum
<i>Eucalyptus crebra</i> F.Muell.	Narrow-leaved Ironbark
<i>Eucalyptus dealbata</i> A.Cunn. ex Schauer	Tumbledown Red Gum
<i>Eucalyptus melanophloia</i> F.Muell.....	Silver-leaved Ironbark
<i>Eucalyptus melliodora</i> A.Cunn. ex Schauer	Yellow Box
<i>Melaleuca bracteata</i> F.Muell.....	Black Tea-tree

Nyctaginaceae

<i>Boerhavia dominii</i> Meikle & Hewson	Tarvine
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Oleaceae

<i>Jasminum lineare</i> R.Br.	Desert Jasmine
<i>Jasminum suavisimum</i> Lindl.....	Small-leaved Jasmine
<i>Notelaea microcarpa</i> R.Br. var. <i>microcarpa</i>	Native Olive

Onagraceae

* <i>Oenothera rosea</i> L'Her ex Aiton	Primrose
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Oxalidaceae

* <i>Oxalis brasiliensis</i> Lodd.....	Wood Sorrel
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Gwydir River

Oxalis perennans Haw. Wood Sorrel

Papaveraceae

**Argemone ochroleuca* Sweet

subsp. *ochroleuca* Mexican Poppy

Pittosporaceae

Bursaria spinosa Cav. Native Blackthorn

Plantaginaceae

Plantago varia R.Br. Variable Plantain

Polygonaceae

**Polygonum aviculare* L. Wireweed

Rumex brownii Campd. Swamp Dock

**Rumex crispus* L. Curled Dock

Portulacaceae

Portulaca filifolia F.Muell. Pigweed

Portulaca oleracea L. Pigweed, Purslane

Portulaca pilosa L. Pigweed

Primulaceae

**Anagallis arvensis* L. Scarlet or Blue Pimpernel

Gwydir River

Proteaceae

Grevillea robusta A.Cunn. ex R.Br.....Silky Oak

Ranunculaceae

Clematis microphylla DC.

var. *microphylla*Small-leaved Clematis

Rhamnaceae

Alphitonia excelsa (Fenzl) Reisseck ex Benth.....Red Ash

Rosaceae

**Rosa rubiginosa* L.....Sweet Briar

**Rubus anglocandicans* A.Newton.....Blackberry

Rubiaceae

Galium migrans Ehrend. & McGillivrayBedstraw

Galium propinquum A.Cunn.Bedstraw

Psydrax odoratum (Forst.f.) S.T.Reynolds & R.J.F.Hend.Iamboto

**Richardia brasiliensis* GomesWhite Eye, Mexican Clover

Rutaceae

Geijera parviflora Lindl.Wilga

Salicaceae

**Salix fragilis* L.Crack Willow

Gwydir River

Santalaceae

Exocarpos cupressiformis Labill. Cherry Ballart

Sapindaceae

Alectryon subdentatus (F.Muell. ex Benth.) Radlk. Rosewood

Dodonaea viscosa

subsp. *angustifolia* (L.f.) J.G.West Hop Bush

Scrophulariaceae

**Verbascum virgatum* Stokes Twiggy Mullein, Green Mullein

**Veronica arvensis* L. Wall Speedwell

Veronica calycina R.Br. Hairy Speedwell

Solanaceae

Solanum amblymerum Dunal ex A.DC. Nightshade

**Solanum nigrum* L. Black-berry Nightshade

Solanum parvifolium R.Br. Nightshade

Stackhousiaceae

Stackhousia muricata Lindl. Stackhousia

Sterculiaceae

Brachychiton populneus (Schott & Endl.) R.Br.

subsp. *populneus* Kurrajong

Gwydir River

Thymelaeaceae

Pimelea neo-anglica Threlfall New England Rice Flower

Urticaceae

Urtica incisa Poir. Stinging Nettle

Verbenaceae

**Phyla canescens* (Kunth) Greene Lippia

**Verbena bonariensis* L. Purpletop

**Verbena caracasana* Kunth Purpletop

Verbena gaudichaudii (Briquet) P.W.Michael Purpletop

Violaceae

Viola caleyana G.Don Violet

Gwydir River

Appendix B: Location of full floristic survey sites.

Site	Date	Zone	Datum	Easting	Northing	Altitude
1	27/12/2012	56	94	272,349.00	6,688,582.00	303
2	27/12/2012	56	94	272,340.00	6,688,502.00	309
3	27/12/2012	56	94	271,826.00	6,688,533.00	303
4	27/12/2012	56	94	271,653.00	6,688,672.00	299
5	27/12/2012	56	94	271,811.00	6,688,671.00	298
6	27/12/2012	56	94	271,677.00	6,688,723.00	300
7	27/12/2012	56	94	271,809.00	6,688,728.00	299
8	27/12/2012	56	94	271,562.00	6,688,693.00	308
9	27/12/2012	56	94	271,505.00	6,689,188.00	298
10	27/12/2012	56	94	271,460.00	6,689,216.00	302
11	27/12/2012	56	94	271,752.00	6,689,187.00	298
12	27/12/2012	56	94	271,852.00	6,689,054.00	298
13	27/12/2012	56	94	271,638.00	6,689,122.00	305
14	27/12/2012	56	94	271,394.00	6,689,690.00	297
15	27/12/2012	56	94	271,272.00	6,689,974.00	296
16	27/12/2012	56	94	270,990.00	6,690,469.00	297
17	27/12/2012	56	94	270,168.00	6,690,979.00	293
18	27/12/2012	56	94	269,167.00	6,691,456.00	302
19	31/12/2012	56	94	269,180.00	6,691,566.00	322
20	31/12/2012	56	94	269,136.00	6,691,590.00	326
21	31/12/2012	56	94	269,131.00	6,691,941.00	309
22	31/12/2012	56	94	269,081.00	6,691,940.00	311
23	31/12/2012	56	94	269,036.00	6,692,257.00	312
24	31/12/2012	56	94	269,079.00	6,692,287.00	300
25	31/12/2012	56	94	268,726.00	6,692,767.00	306
26	31/12/2012	56	94	268,760.00	6,692,809.00	299
27	31/12/2012	56	94	268,991.00	6,692,529.00	297
28	31/12/2012	56	94	267,964.00	6,693,482.00	303
29	31/12/2012	56	94	267,972.00	6,693,852.00	303

Gwydir River

30	31/12/2012	56	94	267,995.00	6,694,218.00	295
31	31/12/2012	56	94	267,822.00	6,694,445.00	299
32	31/12/2012	56	94	267,586.00	6,694,450.00	299
33	31/12/2012	56	94	267,764.00	6,694,205.00	326
34	31/12/2012	56	94	267,883.00	6,694,086.00	320
35	31/12/2012	56	94	267,908.00	6,694,051.00	317
36	31/12/2012	56	94	270,919.00	6,690,404.00	308