

2011/2012



Regent Honey Eater

Inverell Shire

State of the Environment Report

INVERELL SHIRE COUNCIL



Table of Contents

1	INTRODUCTION	5
1.1	Aims and Objectives	5
2	BACKGROUND	6
2.1	General	6
2.2	Climate	7
3	LAND	9
3.1	Land Quality	9
3.1.1	Landform	10
3.1.2	Geology	10
3.1.3	Soils	11
3.1.4	Soil Erosion	12
3.1.5	Contaminated Land	14
3.1.6	Bushfires	15
3.1.7	Pollution Complaints	16
3.1.8	Soil Quality Concerns	17
3.1.8.A	Salinity	17
3.1.8.B	Sodicity	18
3.1.8.C	Acid Soils	19
3.1.9	Noxious Weeds	20
3.1.10	On-site Sewage Management	22
3.1.11	Department of Environment & Climate Change Licenses	22
3.2	Land Use & Management	23
5.1.1	Approvals	23
5.1.2	Land Use	24
5.1.3	Environmentally Sensitive Land	30
5.1.4	Floodplain Management	34
3.3	Border Rivers-Gwydir Catchment Management Authority (CMA)	35
4	AIR	37
4.1	Air Quality	37
4.2	Air Borne Disease's	37
4.3	Dust	37
4.4	Odour	38
5	WATER	38
5.1	Water Quality	38
5.2	Urban Runoff	40
5.3	Groundwater	40
5.4	Local Government Border Rivers Project	41
5.5	Surface Water and Groundwater Salinity	41
5.6	Water Supply and Treatment	41
5.7	Copeton Dam	42
6	BIODIVERSITY	43
6.1	Fish Species	43
6.1.1	Endangered Fish Species	43

6.1.2	Endangered Fish Populations.	44
6.1.3	Vulnerable Fish Species.	45
6.1.4	Endangered aquatic ecological communities.	46
6.1.5	Key threatening processes that occur in Inverell LGA.	46
6.1.6	Significant fish habitats that occur in Inverell LGA.	47
6.1.7	Number of Potential road crossing barriers to Fish.	47
6.1.8	Council's responsibilities under Parts 7 & 7A of the Fisheries Management Act	48
6.2	The Threatened Species Priorities Action Statement (PAS)	48
6.2.1	High Priority Actions	49
6.2.2	Medium Priority Actions	56
6.2.3	Low Priority Actions	62
6.2.4	Recovery strategies	64
6.2.5	Threat abatement strategies	71
6.2.6	Distribution of threatened species, populations and ecological communities	72
6.2.7	Vertebrate pests	73
6.3	Extent and degree of change to native vegetation	74
6.3.1	Vegetation Types – range and distribution	74
6.3.2	Percentage of woody and cleared land	75
6.3.3	Status of public and private land	76
7	WASTE	78
7.1	Landfill Wastes	78
7.2	Hazardous and Toxic Chemicals	79
7.3	Recycling	79
7.4	Sewage Treatment	80
8	ENERGY SUSTAINABILITY	80
9	NOISE	81
9.1	Community Noise	81
9.2	Industrial Noise	81
10	HERITAGE	82
10.1	Aboriginal Heritage	82
10.2	Aboriginal Sites in the Shire	82
10.3	Non Aboriginal Heritage	83

1 INTRODUCTION

This State of the Environment Report is prepared in accordance with the provisions of the *Local Government Act 1993 & Local Government (General) Regulation 1993*, which requires Council to report as to the state of the environment in the area, and in particular in relation to the following environmental sectors:

- **LAND**
- **AIR**
- **WATER**
- **BIODIVERSITY**
- **WASTE**
- **ENERGY SUSTAINABILITY**
- **NOISE**
- **ABORIGINAL HERITAGE**
- **NON ABORIGINAL HERITAGE**

State of the Environment reporting is a key mechanism for assessing progress towards Ecological Sustainable Development (ESD). ESD is defined as using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased. The key principles of ESD are the precautionary principle, inter – generational equality, ecological integrity (biodiversity conservation) and economic considerations. The National Strategy for ESD was endorsed in 1992 by all Australian Governments and the Australian Local Government Association.

State of the Environment Reporting incorporates not only information collated at a Local Government level, but also by other tiers of Government. The information gathered is designed to provide data to assist the public, three tiers of Government and others in the public sector in their decision-making processes.

The State of the Environment Report is a dynamic document and will change and evolve as environmental issues, large or small, are resolved and other issues arise. As Council is acting for the community the general public have a role to play in identifying issues that affect the environment. The public will also be involved in the formulation of policies and plans that will play a role in rectifying or preventing damage to the environment now and in the future.

Much of the information contained in this report has been provided by or obtained from other sources. Council can accept no responsibility for the accuracy of such information.

1.1 Aims and Objectives

The aims and objectives of the Inverell Shire Council's State of the Environment Reporting include: -

- (a) To provide comprehensive information on the current state of the environment within the Shire. This reporting year covers the period 1 July 2011 to 30 June 2012.
- (b) To provide information to help government departments and the community to gain a comprehensive picture of the local environment and to assist in decision making, education and identifying future needs.

- (c) To ensure that the environment is protected and enhanced, facilitating a healthy and safe lifestyle for all, and to promote biodiversity. This aim however must be achieved while ensuring an equitable balance between the environment and social and economic development.
- (d) To provide the necessary foundation for strategic environmental planning, and the development of environmental rehabilitation, restoration and protection initiatives.

While the above aims are long term, the short-term objectives of this and future reports are to identify environmental issues, to identify relevant information that can be retrieved easily and to identify gaps in the information that will require further research. This information can then link into Council's Management Plan and budgeting process

The information gaps should be filled over subsequent years so that over time an adequate reference and database can be compiled.

This report and subsequent reports will highlight progress towards goals set in previous State of the Environment Reports and set goals for the future where necessary.

2 BACKGROUND

2.1 General

The Inverell Shire is located on the North West Slopes and New England Tablelands in Northern NSW. It extends from the Queensland NSW Border down to Copeton Dam and Maybole in the south. The Western boundary passes near Koloona and Coolatai and the eastern boundary crosses east of Swan Vale between Inverell and Glen Innes. The Shire covers an area of 8623 km² and includes the towns of Inverell and Ashford and Villages of Delungra, Yetman, Gilgai, Bonshaw and Graman.

As per the 2011 Census there were 16,075 persons usually resident in Inverell Local Government Area (LGA): 49.1% were males and 50.9% were females. Of the total population, 6.6% were Indigenous persons, compared with 2.5% Indigenous persons in Australia.

The population figure for the Inverell LGA increased 0.71% between the 1996 Census and the 2001 Census, with the current population figure having increased 2.05% from the 2001 Census. Below is a graph which shows the population numbers from 1996, demonstrating a significant and consistent growth rate. All figures given are provided from the ABS.

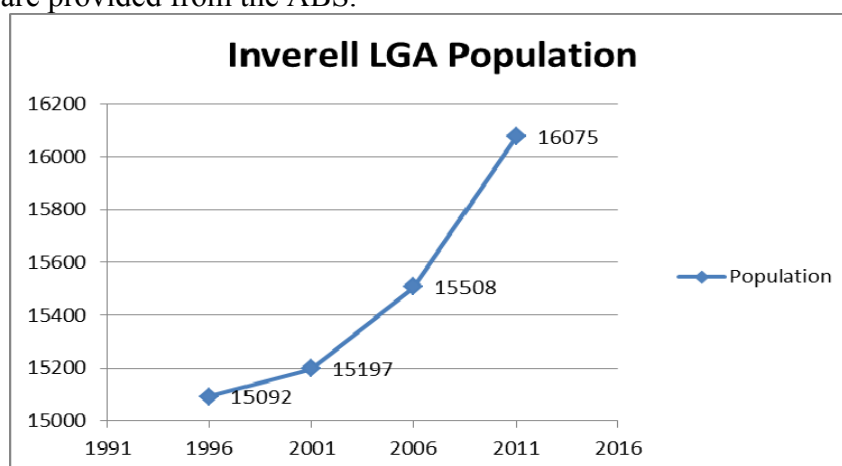
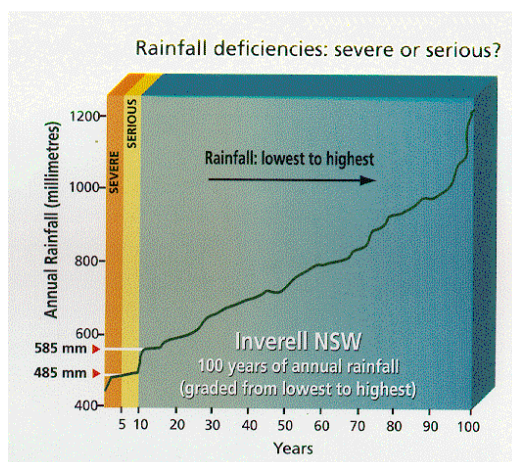


Figure 1 - Inverell LGA Population Numbers 1996-2011

- A severe rainfall deficiency – exists in a district when rainfall for three months or more is in the lowest 5 % of records (Graph 1 – orange part)
- A serious deficiency lies in the next lowest 5 % i.e. lowest 5 % to 10 % of historical records for a three month or longer period (Graph 1 – yellow part)



Graph 1 - 100 years of annual rainfall, Inverell NSW

2.3 Social Indicators

The 2011 Census revealed that:

1. 88.9% of persons usually resident in the Inverell LGA stated they were born in Australia. Other common responses within the Inverell LGA were: England 1.4%, United States of America 0.8%, New Zealand 0.6%, Philippines 0.4% and Brazil 0.3%.
2. English was stated as the only language spoken at home by 94.5% of persons usually resident in the Inverell LGA. The most common languages other than English spoken at home were: Italian 0.3%, Portuguese 0.3%, Tagalog 0.2%, German 0.1% and Filipino 0.1%.
3. The most common responses for religious affiliation for persons usually resident in the Inverell LGA were Anglican 32.9%, Catholic 22.8%, No Religion 13.7%, Presbyterian and Reformed 7.5% and Uniting Church 5.8%.
4. 51.3% of persons aged 15 years and over usually resident in the Inverell LGA were married, 29.2% never married, 11.8% separated or divorced and 7.6% widowed.
5. There were 4,334 families in Inverell (A) (Local Government Area): 43.2% were couple families with children, 38.3% were couple families without children, 17.1% were one parent families and 1.3% were other families.

2.4 Age, Housing and Employment

The 2011 Census revealed that:

6. 21.3% of the population usually resident in the Inverell LGA were children aged between 0-14 years, and 31.9% were persons aged 55 years and over. The median age of persons in Inverell LGA was 41 years, compared with 37 years for persons in Australia.

7. The median weekly income for couple families with two incomes without children was \$1372, compared with \$2081 in Australia. The median weekly income for couple families with two incomes with children was \$1677, compared with \$2310 in Australia. In Inverell 36.1% of households had a weekly household income of less than \$600 and 3.4% of households had a weekly income of more than \$3,000.
8. There were 6,080 occupied private dwellings counted: 90% were separate houses, 1.2% were semi-detached, row or terrace house, townhouse etc., 7.6% were flat, unit or apartment and 1.2% were other dwellings.
9. The median weekly rent was \$160 compared to \$285 for Australia. The median monthly housing loan repayment was \$1200, compared to \$1800 for Australia. The average household size was 3.1 and the average number of persons per bedroom was 1.2.
10. 38.3 % of occupied private dwellings were fully owned, 29.7 % were being purchased and 27.9 % were rented.
11. 70.2 % of occupied private dwellings were family households, 27.5 % were lone person households and 2.3 % were group households.
12. The most common responses for occupation of employed persons usually resident in Inverell LGA were Managers 17.9 %, Labourers 15.6 %, Technicians and Trades Workers 13.2%, Professionals 14.0 %, Community and Personal Service Workers 11.0 % clerical and Administrative Workers 9.8 %, and Machinery Operators and Drivers 5.6 %.
13. The most common industries of employment for persons aged 15 years and over usually resident in Inverell LGA were sheep, beef cattle and grain farming 11.2 %, school education 6.6 %, meat and meat product manufacturing 6.2 %, residential care services 3.6 %, and supermarket and grocery stores 3.2 %.

2.5 Sustainability

Council is committed to the protection and enhancement of the environment that sustains our Community.

This commitment extends beyond the environment protection imperative that is contained in the *NSW Local Government Act, 1993*. It is a reflection of this Council's growing sense of responsibility of the environment and the need to display leadership in the stewardship for this precious resource that we all share. Stewardship of the environment can be demonstrated through Council's day to day practices and strategic planning.

It is understood that for a community to be sustainable requires a healthy community, a healthy economy and a health environment. These three notions are inexorably linked – a healthy environment is the cornerstone which underpins a community ability to develop economically and socially.

Council has created an Environmental Sustainability Plan which identifies four (4) focus areas and outlines the actions to be undertaken by Council to enhance these focus areas.

The Action Plan will be reviewed each year and a comprehensive review undertaken every four (4) years. This Plan is proposed as a framework for community involvement in the sustainability journey.

3 LAND

3.1 Land Quality

The Inverell Shire's landform benefits greatly from the typical changing category of topography associated with the Northwest Slopes and plains. The picturesque landform of the shire has variations from undulating hilly areas to the east, to the rich flat alluvial plains to the west of the shire. The 8,623 square kilometres that makes up the Inverell Shire has two major river systems, two major water storage dams, 6 National Parks, 7 State Forests, 4 Nature Reserves and 1 State Conservation Area comprising of a total of 41 194 hectares.

3.1.1 Landform

The Inverell Shire is mostly on the North West Slopes however the extreme eastern section is part of the New England Tablelands. These two geographical zones (Tablelands and Slopes) can be divided into four categories

- Mostly Flat - gradient of less than 1 in 20 or 3° approx. 36%
- Undulating to hilly - slopes > 3° and < 8° or 1 in 7 approx. 45%
- Hilly to steep - slopes > 8° and < 15° or 1 in 4 approx. 18%
- Rugged or mountainous - slopes greater than 15° or 1 in 4 . <1%

The 'mostly flat' areas are generally on basaltic and sedimentary areas with examples being the basaltic areas to the north of Inverell and the sedimentary regions around Ashford and along the Severn River. The majority of these flats are cleared and used for irrigated and dryland crops or grazing.

The 'undulating to hilly' country is spread throughout the district and generally occurs on sedimentary or granite parent material. The extent of cleared country varies and is mostly used for grazing, with forage crops grown in some areas. The 'hilly to steep' country is mostly in the northern and eastern regions on granite parent material. Most of it still remains under heavy timber cover. The 'rugged or mountainous' country is on the boundary of the shire along the Gwydir River below Copeton Dam.

A combination of soil type, landform and land use is important in determining the susceptibility of country to soil degradation and hence its potential land uses and management requirements.

3.1.2 Geology

The geology of the Inverell Shire can be broadly classified into four categories

- Early Paleozoic (Silurian to Permian) and Mesozoic sediments and metamorphics - sandstones, cherts and greywackes situated in the northern and south-western parts on the shire
- Paleozoic (Permian) granites and volcanics, situated in the northern, north-eastern and extreme southern sector of the shire.
- Cainozoic (Tertiary) basalts, situated in the central south and parts of the western fringes of the Shire.
- Cainozoic (Quaternary) deposits of alluvium in the valleys and flood plains.

3.1.3 Soils

Red & Yellow Solodic Soils (Sodosol – Australian Soil Classification) – These soils occur in a broad band from around Ashford to the border. These soils are generally neutral and soils are generally under open pastures and timbered pastures. They are highly erodible due to their high sand and gravel content. This characteristic also gives these soils a low water holding capacity. Soil fertility is also generally low.

Lithosols and solods (Sodosol and Tenosol – Australian Soil Classification) – These fall into the Skeletal Soil Group. The texture varies from sandy clay loam to heavy clay and the pH ranges from neutral to alkaline. As these soils are highly erodible and tend to occur on steep slopes, when they are over cleared and over grazed they are very susceptible to gully and sheet erosion and landslips. These soils are generally shallow, stony and have a low water holding capacity and fertility. Hence most areas are still under timber or grazed as a timbered pasture.

Grey brown and yellow podsols (shallow) (Chromosol, Kurosol, Hydrosol and Tenosol – Australian Soil Classification) – These soils are characterised by extensive granitic rock outcrops or rocky fields on the crests and side slopes of hills. This soil is neutral. The Gleyed Podsollic soils are moderately deep to deep duplex soils. This soil has a neutral pH. The Siliceous sands are yellow to greyish yellow brown. They may be shallow or deep and have very little to no structure. The soil profile is either uniform or gradational and the pH is acid. These soils are generally used for timbered pastures, open pastures or forest. The sand content of these soils makes them very susceptible to sheet and gully erosion and gives them a low water and nutrient holding capacity. However, if massive granitic rock layers occur near the surface, drainage may be restricted.

Grey and brown alluvials (Tenosol – Australian Soil Classification) occur along watercourses (flood plains). They are deep brown to dark grey uniform light clay soils with a well developed structural profile. The A2 horizons are absent. Calcium carbonate may be present in the B horizon. Seasonal cracking may occur. Soil reaction is neutral to alkaline. The soil are generally found in areas where sediment accumulates, however, flooding may also remove a lot of this soil unless it is well protected by dense groundcover. Fertility varies from moderate to good and soil physical characteristics are generally desirable. The land is used for cropping and pastures.

Euchrozems (Dermosol – Australian Soil Classification) – These soils form on the highest parts (around 600m) of the Tertiary basalt landscape that surrounds Inverell township. Areas are found between Inverell, Bukkulla, Graman and Delungra. They are red, strongly structured clay soils with less clay content near the surface. They are generally 1-2 metres deep and neutral pH. The A1 horizon is generally darker however the other horizons may not be differentiated. Carbonate may be found at the base of the solum and small, black ferromanganiferous nodules are usually present in the subsoil. These soils are typically used for cropping, pasture and orchards. They have low erodibility and good physical characteristics, being friable yet having moderate clay content. Their fertility is moderate but often deficient in nitrogen and phosphorus.

Black earths (Vertosol – Australian Soil Classification) – These soils are found below an altitude of 600m in the tertiary basalt landscape on foot slopes and floodplains. They are uniformly dark brown to black cracking clays with a friable and self-mulching surface. The structure becomes coarser and the presence of calcium carbonate nodules increases with depth. The soils are shallow to moderately deep. The soils are used for cropping, pasture and timbered pasture. Cropping increases the risk of sheet and gully erosion, hence soil conservation structures may be necessary. However, due to the cracking nature of the soil these structures may fail. The soils generally have good physical characteristics; although they may become sticky when wet (limiting their ability to handle machinery soon after rain – particularly important in cropping situations). Their fertility is inherently good.

Chocolates and associated krasnozems (Red brown Clays) (Ferrosol – Australian Soil Classification)– Generally found on the mid- to upper side slopes with the Krasnozems on the hill tops above the chocolates. The chocolates are well structured with a dark brown clay loam A horizon and a brown to dark reddish brown clay B horizon which may contain basalt pebbles and stones. These soils are moderately deep, from 1.5-2m. The Krasnozems are well structured and friable. The A horizon is reddish brown to dark reddish brown loam to light clay. Redness increases with depth. Rocks and boulders occur on the surface and throughout the profile. These soils are generally shallow to about 1m deep. Both soil types have a neutral pH, a high cation exchange capacity and low inherent erodibility.

Lateric red earths (Kandosol – Australian Soil Classification) – occur around Gilgai within a typical granite landscape. These soils are deep, massive soils. They are predominantly sandy textured, porous and earthy soils that are bright red in colour. Clay content increases with depth. The B horizon contains ironstone nodules overlying a thick mottled zone of light grey to white, red and yellow brown clay. The soils are used for pasture, cropping, timber, orchards and mining. Their inherent erodibility is low and being deep and well drained, have good characteristics for plant growth. However, as they have a low clay content, their water and nutrient holding capacity is low (increasing organic matter content can substantially improve this capacity).

The Border Rivers – Gwydir Catchment Management Authority (CMA) has implemented soil and land use targets that state:

- By 2015 increase by at least 50 000 hectares the area of the catchment that is managed to provide a net improvement in soil condition
- By 2015 an additional 15 000 hectares of land will be managed to improve soil condition with priority given to ground cover and the most limiting soil health indicators within each primary sub catchment

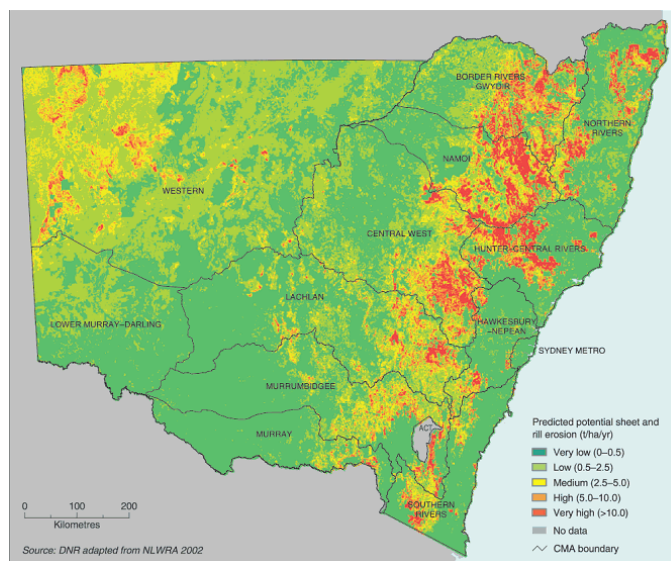
The intent of the net soil condition improvement target is to ensure that the connection between improved management practices and soil health is established in the community. One of the main actions to improve soil health is the adoption by landholders of the Land and Soil Capability system. If land is used in a manner consistent with the recommendations for its class there will be no long term negative impacts on the soil such as erosion, salinity, acidity and loss of structure.

The improved soil condition with priority to groundcover and the most limiting soil health indicators target provides the CMA with the opportunity to improve soil condition through subtle management changes. Increasing groundcover is seen as one of the key steps to improving soil health. Groundcover protects the surface from water and wind erosion, roots add to the carbon balance, increases soil biodiversity, improves soil structure and aeration, increases infiltration as less water is lost to runoff and provides protection against drought.

3.1.4 Soil Erosion

Soil Erosion has been described as the most widespread form of land degradation and the biggest environmental problem in the Macintyre Catchment (Peasley, 1993). Soil erosion is commonly caused by wind and water due to reduced vegetative cover in an area. Soil disturbance through urban development, forestry, agriculture and mining often leads to some degree of soil erosion. Sheet, rill, gully, tunnel, wind and mass movement are the commonly recognised forms of erosion. They all occur in the Macintyre Catchment (see Map 2). Most erosion correlates to areas that are cultivated on a regular basis, with lesser

degrees in grasslands and timbered land. The distribution of erosion in the Inverell Shire is patchy with concentrations in the east through to the west.



Map 2 - Predicted potential mean annual sheet and rill erosion rates for NSW

Sheet Erosion

Sheet erosion is common in cultivated soils, particularly when they have been recently ploughed or are in fallow, as well as on grazing land where overgrazing has removed nearly all of the ground cover (grass, forbs, shrubs etc). Soil particles are detached by the impact of raindrops and are removed down-slope by water flowing overland as a sheet that is more or less a uniform layer of fine particles. Because sheet erosion impacts on a wide surface area topsoil is lost. Sheet erosion varies in degree from minor to extreme throughout the Inverell Shire.

Rill Erosion

Rill erosion occurs on cultivated soils or grazing land that has reduced vegetation cover. Water concentrates in shallow depressions as it flows downhill. This results in the formation of streamlets which remove tiny gullies of soil called rills. If these streamlets widen and deepen, they can cause gully erosion. This is particularly extensive in the cropping areas as fallow periods result in unprotected soil being readily removed, particularly by intensive summer storms characteristic of the Inverell Shire. Rill erosion varies in degree from moderate to extreme throughout the Inverell Shire.

Gully Erosion

Gully erosion can occur on all landforms and soil types and under all land uses. However, it is most likely to occur when plant roots and organic matter (humus) no longer hold the soil together or soil structure is weakened from overgrazing or cultivation. Gullies may also form when natural drainage lines become actively eroded or when overland flow becomes significantly concentrated to create a channel on both cultivation land and grassland. Lighter soils and those with weak sub-soils are more susceptible to gully erosion than some of the heavier soils. The black earths overlying yellow earths and siliceous sands in the Wallangra, Coolatai, Yetman areas and the hard-setting infertile yellow and red solodic soils located on the foot slopes and lower slopes around Ashford, Texas and Emmaville are all particularly vulnerable (Peasley 1993). In the Inverell Shire gully and streambank erosion are more common on land that is used for cultivation and grasslands, and is not very common within areas of remnant vegetation. Most of the gully and streambank erosion in the Inverell Shire stems from drainage lines, and ranges from minor to extreme gully erosion minor streambank erosion.

Tunnel Erosion

Tunnel erosion generally occurs when water moves along channels and cracks in dispersive subsoils. Water may reach the sub soil through rabbit burrows, old tree stump holes etc. Clay particles are readily removed by the water while larger particles consisting of silt and fine sand fall into the flow and steadily build a tunnel. The first indication of tunnel erosion is usually the occurrence of a fine sediment fan at the outlet point of the developing tunnel. Eventually the thin topsoil caves in, exposing the tunnel. Tunnels may completely collapse and form gully erosion.

Wind Erosion

Wind erosion is the detachment, transportation and re – deposition of soil particles by wind. Soils with poor soil structure and low organic matter are particularly susceptible to wind erosion; however soils that have been heavily cultivated are also susceptible to wind erosion. Hard-setting grey and brown clays, red brown earths and calcareous red earths are all very susceptible to wind erosion. Wind erosion is very difficult to map and there are no areas mapped in the Inverell Shire.

Mass Movement

There are several types of mass movement, which include soil creep, earthflow, slumps, landslips, landslides and rock avalanches. The latter are generally more severe and are often preceded by soil creep. Mass movement generally only occurs on moderate to steep slopes ($>12^\circ$), however, it can occur on slopes as low as 6° on more unstable soils. It generally occurs where vegetation has been cleared. The dispersed soil, being loose is often prone to further erosion and can contribute to stream turbidity. There are only a few areas of minor mass movement mapped in the Shire occurring in the south eastern corner. However, other minor cases occur along the Macintyre River and occur in isolated areas across the shire.

The Border Rivers – Gwydir CMA has catchment management targets for erosion in regards to water quality and discharge areas as follows:

By 2015 improve river systems through the rehabilitation of 100 kilometres of stream to decrease the rate of erosion and sedimentation in priority locations as identified through the Riverine Condition Assessment Index.

By 2015 manage a minimum of 500 hectares of saline discharge areas to reduce runoff and erosion.

It is recognised that erosion is a natural river process so this target will focus investment on priority locations that are the result of accelerated or unnatural erosive processes. Management actions addressing this target will be consistent with best management practices and will include remediation through engineering works or through management of vegetation, land use and river flow. The improvements to riverbeds and banks will improve water quality and habitat value and prevent further degradation within the catchment.

The intent of the discharge areas target is to prevent saline discharge areas worsening and contributing to further land degradation problems such as erosion and poor water quality. Management options will include activities such as maintaining groundcover, excluding stock and planting salt tolerant species. This target is focused on minimising the local impacts of saline discharge areas.

3.1.5 Contaminated Land

Seven (7) sites at Inverell are listed on the Office of Environment and Heritage's register of contaminated sites notified to the EPA. Past and current petrol stations are the most likely sites for unidentified contaminated land. Common contaminants at these sites are petroleum hydrocarbons, benzene, toluene, ethylbenzene and xylene.

The Department of Environment & Climate Change regulates such sites as landfills, sewage treatment works and abattoirs through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).

3.1.6 Bushfires

Fire is a natural phenomenon, however the frequency of fire, its intensity and the season in which it occurs are some of the major factors influencing the distribution of vegetation communities and animal species. Inappropriate fire management practices have the potential to cause localised extinction of some plants and animals. Management of fire is an important and complex issue. It must aim to achieve both long-term conservation of natural communities and ongoing protection of life and property within and adjacent to areas of bushfire hazard.

In general the bushfire hazard in the Shire is moderate to high, with the highest hazard time being during periods of drought. Due to the current weather patterns and drought conditions, it has been difficult for the Bushfire Brigades to conduct any hazard reduction programs throughout the Shire. All fire events are normally reported to the local Rural Fire Service.

There has been pressure placed on Council with the demand for development in hazard areas within the Shire. A *Bush Fire Risk Management Plan* has been prepared to identify the level of risk posed by bush fires to assets and establishing strategies to protect these assets from the adverse effects of bushfire. The areas of concern in the Inverell Shire are the National Parks, State Forests and conservation reserve areas where minimal hazard reduction is being undertaken.

The Rural Fire Service requires that residential development in bushfire prone areas comply with the criteria set out in the document *Planning for Bushfire Protection 2006*. This document provides criteria for the provision of Asset Protection Zones, property access, water for adequate fire fighting, controls that avoid placing inappropriate developments in hazardous areas and methods and materials for the construction of buildings within bushfire prone areas.

The following map shows the areas of affected land as prescribed by NSW Rural Fire Service:



Inverell Shire Council BUSHFIRE PRONE LAND

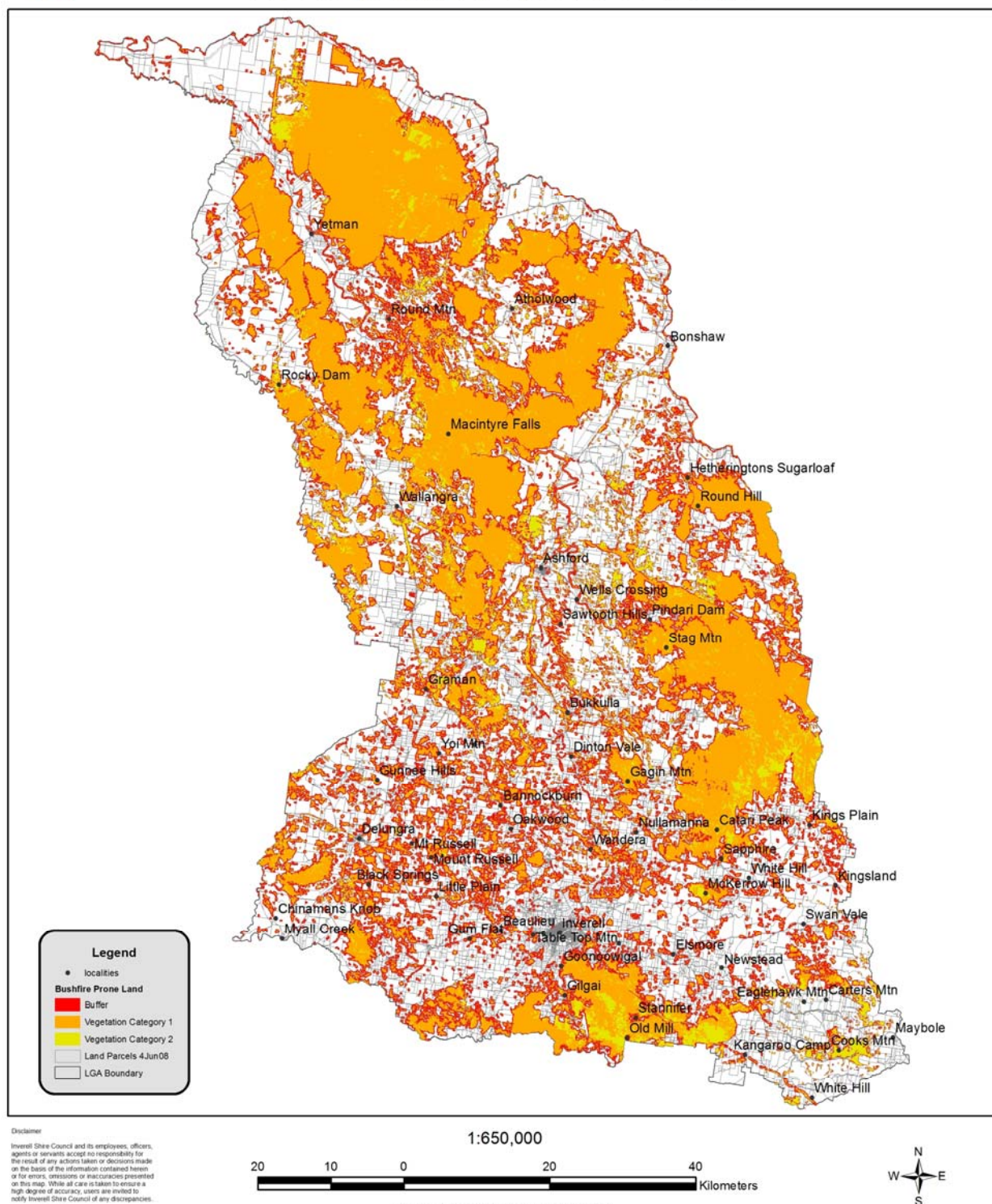


Figure 2 - Bushfire Affected Land in Inverell Shire

3.1.7 Pollution Complaints

Council received a number of complaints with respect to pollution during the reporting period. These complaints include air and ground pollution relating to odours, noise pollution mainly in the form of barking dog complaints and some minor incidents such as littering and illegal dumping of rubbish.

3.1.8 Soil Quality Concerns

3.1.8.A Salinity

Salinity is a major concern in many sub-catchments of the Inverell Shire. The major causes of salinity are:

- The erosion of top soil to expose naturally saline sub-soil. This is known as a saline scald.
- The replacement of high water using vegetation (generally deep tap rooted perennials) with shallow fibrous rooted annual crops or pastures which use less water and therefore allow more water to enter the groundwater, causing the water table to rise. As it rises it dissolves salts from the soil and deposits them in the root zone or on the soil surface as the water evaporates.

Salinity outbreaks are known to occur in the Mt Russell, Bannockburn, Nullamanna, Bundarra and Ashford areas. Salinity problems were first acknowledged in the 1960's and 70's and some work was done on sites during that time. In the late 80's and early 90's, the Soil Conservation Service (now Department of Lands NSW) installed piezometers (water quality monitoring bores) to monitor the extent of the problem in the Bannockburn, Mt Russell and Ashford areas.

There are two main types of salinity. These are:

- Dryland Salinity. This is caused when the rising water table brings natural salts in the soil to the surface. The salt remains in the soil and becomes progressively concentrated as the water evaporates or is used by plants. One of the main causes for rising water tables is the removal of deep rooted plants, perennial trees, shrubs and grasses and their replacement by annual crops and pastures that do not use as much water.
- Irrigation salinity. This occurs when irrigation water soaks through the soil area where the plant roots grow, adding to the existing water. The additional irrigation water causes the underground water table to rise, bringing salt to the surface. When the irrigated area dries and the underground water table recedes, salt is left in the surface soil. Each time the area is irrigated this salinity process is repeated.

There are several different types of management options recognised. These are:

- Biological Control of recharge – this is the planting of deep rooted perennial plants to use water in the area where water enters the groundwater system or the recharge site. This option could take decades or even hundreds of years to improve salinity influenced by a regional groundwater flow system.
- Engineering options – e.g. ground water pumping. This is very expensive so is generally only used in areas where high value assets such as towns are at risk. This doesn't actually fix the problem.
- Productive use of saline land and water – this is the use of the discharge or outbreak site e.g. planting salt tolerant pasture species for grazing, establishing salt water aquaculture, salt harvesting etc.

The Border Rivers – Gwydir Catchment Management Authority has determined a target as follows for in stream salinity:

“By 2015 reduce the salt load at Mungindi by 2500 tonne and at Bronte (Mehi) by 650 tonne”

The intent of this target is to reduce salinity in waterways. Decreases in salt loads and electrical conductivity (EC) will reflect improved water quality. This can be through remediation of sources that include high flow bored, sewerage treatment plants and particular problem locations. Revegetation using native or exotic pasture can greatly reduce the amount of salt laden sediment reaching waterways. The Border Rivers – Gwydir Catchment Management Authority has targets to ensure that salinity does not become a major degradation issue in the area as follows:

- Groundwater recharge areas – by 2015 increase by at least 50 000 hectares the area of the catchment that is managed to produce net improvement in soil condition
- Discharge areas – By 2015 manage a minimum of 500 hectares of saline discharge areas to reduce runoff and erosion

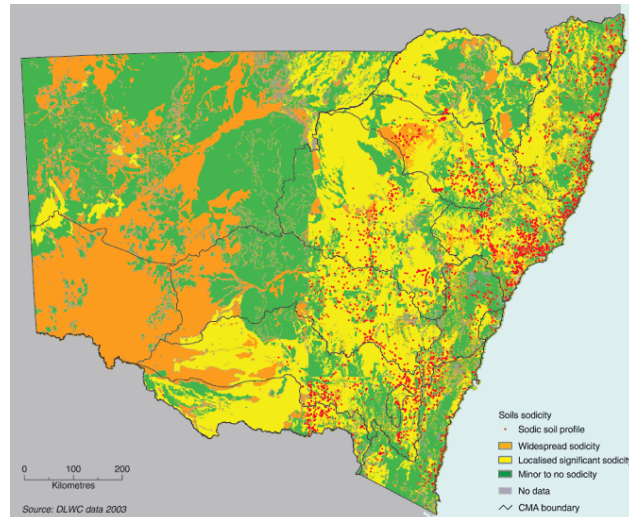
The intent of the target in regards to groundwater recharge areas is to reduce the potential for salt affected land to occur in this region through education and investment in changed management practices. Investment will focus on providing education and awareness programmes to landholders that detail any new and improved land management practices that reduce the potential for salinity (riverine and dryland) to occur in the region. A recognised cause of increased salinity is raised groundwater levels from excess deep drainage of water beyond the root zone of plants. One of the management actions to achieve this target is to encourage the establishment of deep rooted perennial vegetation that optimises the use of water in the root zone.

The intent of the target in regards to discharge areas is to prevent saline discharge areas worsening and contributing to further land degradation problems such as erosion and poor water quality. Management options will include activities such as maintaining groundcover, excluding stock and planting salt tolerant species. This target is focused on minimizing the local impacts of saline discharge areas. Mapping of saline discharge areas is not complete.

Salinity processes and risks in the Border Rivers and Gwydir areas are not well understood and there is inadequate information to appropriately target and design management and remedial investments. In the Inverell Shire the majority of salting occurs on land that is used for regular cultivation.

3.1.8.B Sodicty

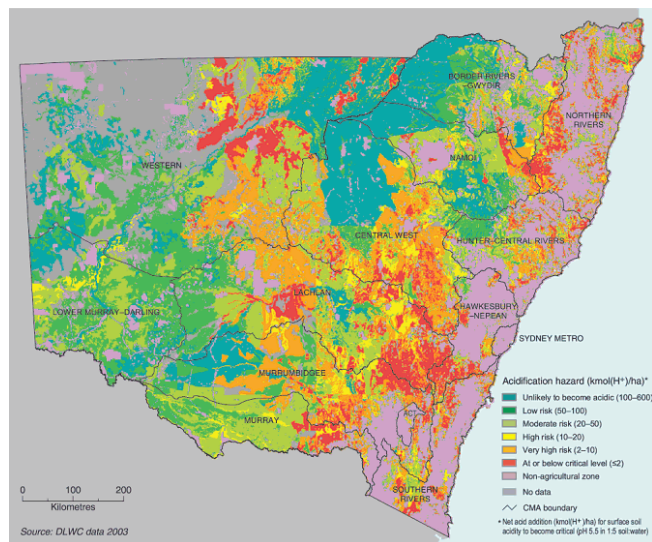
Sodic soils are often associated with saline soils. Sodic soils occur naturally where marine sediments were formally located and are characterized by a high concentration of sodium ions. Sodic soils are characterised by the dispersion of clay particles when wet and the hard setting of clay particles when dry. Sodic soils usually have poor water infiltration, slow internal drainage, erosion and surface crusting, which in turn reduces vegetation growth by affecting seed germination and preventing root penetration of the soil. The Border Rivers – Gwydir Catchment has widespread to minor or no sodicity (Map 3).



Map 3 - Current knowledge of distribution of sodic soils and sodic soil profiles in NSW

3.1.8.C Acid Soils

Acid soils are those having a pH less than 5.5 when measured as 1:5 soil: water. The slow, natural process of soil acidification has been accelerated by modern agricultural farming systems which alter the carbon and nitrogen cycles, such as through the use of improved pasture species, legume-dominant pastures and the application of fertilisers. The four main acidifying processes are: leakage of nitrate below the root depth, oxidation of ammonium fertilisers, accumulation of soil organic matter, and export of plant and animal products from the land. The Border Rivers – Gwydir catchment has an acidification hazard ranging from unlikely to become acidic to very high risk without lime application (see Map 4). Soils in the Inverell Shire are also not considered to be potential acid sulphate soils.



Map 4 - Acidification hazard for agricultural land in NSW

3.1.9 Noxious Weeds

Weeds pose a serious threat to human and animal health, to primary production and to our natural environment. They can reduce farm productivity, displace native species and contribute to land degradation and reduced land values.

The objective of Council's noxious weed control program, therefore, is to reduce the incidence and limit the spread of noxious weeds throughout the Shire. Council seeks to achieve this by a combination of on-going publicity, advisory services, property inspections, roadside surveillance and on-ground weed treatment activities.

Property Inspection Program

Council's property inspection program targets priority weeds including Parthenium weed, Blackberry, Mother-of-millions, Silverleaf nightshade, St John's wort, Green cestrum, Chilean needle grass, Water lettuce, Blue heliotrope, Tropical soda apple and Water hyacinth. Many of these weeds are only evident at certain times of the year; property inspections are scheduled accordingly.

Cooperation between Council's Weeds Officer and local landholders is generally good. Weeds Officers certainly have a regulatory function but priority is given to that of an advisory role first. Over time, better outcomes are achieved through maintaining a good rapport with the landholders. Landholders often benefit in other ways from a visit from the local Weeds Officer and, for example, help with on-farm identification of noxious and other problem plants.

Roadside Treatment Program

Roadside weed management programs were pursued to the limit of available funds. Weeds were dealt with on a priority basis, particular attention being paid to St John's wort because of its ability to spread so quickly. Other important weeds included Parthenium, Green cestrum, Mother-of-millions, Chilean needle grass, Tropical soda apple and Water hyacinth.

Pesticides Use Notification Plan

The *Pesticides Act 1999* obligates Councils to give prior notification of intended use of pesticides in areas open to the public. Council places advertisements in the local newspaper and applies on-site signage as applicable. These announcements are also published in the Environmental section of Council's website www.inverell.nsw.gov.au.

Weeds Awareness Publicity

Council pursues a strong policy of promoting weeds awareness through newspaper articles, radio advertisements, mail-outs to landholders and participation in local agricultural shows and other field days.

Council uses its website to provide current information sheets on the main noxious and other environmental weeds in Inverell Shire. The website also maintains a full list of the Shire's declared noxious weeds.

Attached images:

St John's wort (*Hypericum perforatum*) – a priority weed in Inverell Shire



Figure 3 - St Johns Wort (*Hypericum perforatum*)

Mother-of-millions (*Bryophyllum* sp.) – common garden plant, but very toxic to cattle



Figure 4 – Mother-of-millions (*Bryophyllum* sp.)

3.1.10 On-site Sewage Management

On the 9th March 1998 the NSW Government introduced a package of Local Government regulatory reforms and guidelines to enable more effective council regulation and performance supervision of household septic tanks and other small on-site sewage management (OSSM) facilities. Surveys indicated that a large percentage of sewage management facilities were failing to meet environmental and health protection standards in all parts of NSW. Regular and consistent inspection by Council will only enforce and ensure the proper workings of these units.

It had been estimated that there may be around 4,600 systems installed within the Shire.

Council has continued to inspect systems throughout the Shire and issuing an approval to operate where the system meets the requirements of the guidelines. Applications to inspect are still being received, particularly when there involves in a change of ownership. The Solicitors usually require the approval to operate as a part of the settlement process.

Council approved 25 OSSM septic applications in the reporting period. These approvals included systems that required attention due to the failure of the system on inspection. In these cases the owners are advised that their systems have failed the inspection and require upgrading and further that a re-inspection is required prior to any approvals being issued.

1998	479
1999	1,297
2000	74
2001	79
2002	87
2003	88
2004	96
2005	90
2006	117
2007	164
2008	45
2009	31
2010	50
2011	24
2012	25
Total	2,721

Table 2 - Number of OSSM applications to Inverell Shire Council

3.1.11 Department of Environment & Climate Change Licenses

The Protection of the Environment Operations Act 1997 provides a single licensing arrangement to replace the different licenses and approvals under existing separate Acts relating to air pollution, water pollution, noise pollution and waste management. The Department of Environment & Climate Change (DECC) is the appropriate regulatory authority for the activities specified in Schedule 1 of the POEO Act. In most cases, local councils are the regulatory authorities for non-scheduled activities.

Licenses are no longer fixed-term annual licenses, but remain in force until suspended, revoked or surrendered. The DECC must review the licence at least once every three years. Integration of DECC licensing with the development approval procedures under the Environmental Planning and Assessment Act, 1979 provides for public participation in the environmental assessment of activities that may be licensed by the EPA.

A search of the Department of Environment & Climate Change database for Premises Licensed under the Protection of the Environment Operations Act revealed thirteen license-holders in the Inverell Local Government Area.

Number	Name	Location
11970	Australian Gemstone Resources Pty Ltd	"Kew" Waterloo Road, Inverell, NSW 2360
3725	Consolidated Manufacturing Enterprise Pty Ltd	Swanbrook Road, Inverell, NSW 2360
11223	Great Northern Mining Pty Ltd	Western Feeder Road, Glen Innes, NSW 2370
3323	Gunnee Feedlot Pty Ltd	"Gunnee Station", Delungra, NSW 2403
7190	Hunter and New England Area Health Service	Swanbrook Road, Inverell, NSW 2360
580	Inverell Shire Council	Cemetery Road, Ashford, NSW 2361
4414	Inverell Shire Council	Burnett Street, Delungra, NSW 2403
4412	Inverell Shire Council	Beaumont Road, Ashford, NSW 2361
4463	Inverell Shire Council	Minnamurra Lane, Inverell, NSW 2360
718	Inverell Shire Council	Ashford Road, Inverell, NSW 2360
7463	Inverell Shire Council	Burtenshaw Road, Inverell, NSW 2360
10802	Regional Infrastructure Pty Ltd	Bannockburn Road, Inverell, NSW 2360
809	Yolarno Pty Ltd	Warialda Road, Inverell, NSW 2360

3.2 Land Use & Management

5.1.1 Approvals

From 1 July 2011 to 30 June 2012 a total of 214 combined development and complying applications were approved at an estimated building value of \$21,110,028.

Year	Total Applications	Value of Work
Total 1993	358	\$12,327,920.00
Total 1994	359	\$11,470,512.00
Total 1995	330	\$11,459,944.00
Total 1996	270	\$6,303,183.00
Total 1997	271	\$7,869,251.00
Total 1998	292	\$9,148,942.00
Total 98/99	237	\$10,161,013.00
Total 99/00	288	\$14,042,422.00
Total 00/01	188	\$8,833,528.00
Total 01/02	210	\$11,255,876.00
Total 02/03	216	\$11,015,279.00
Total 03/04	263	\$18,140,793.00
Total 04/05	409	\$ 27,643,034.00
Total 05/06	369	\$ 29,704,973.00
Total 06/07	385	\$ 36,756,866.00
Total 07/08	331	\$ 25,629,539.00
Total 08/09	313	\$31,723,782.00
Total 09/10	363	\$36,069,786.00
Total 10/11	263	\$22,512,372.00
Total 11/12	214	\$21,110,028.00

Table 3 - Comparative Building Figures based on Development Applications and Complying Development Applications in Inverell Shire, 1993 - 2012

From 1 July 2005, all development applications and complying development certificates for new residential buildings will have to be accompanied by a BASIX Certificate. This certificate is a web based planning tool designed to assess the potential performance of residential buildings against a range of sustainability indices. This tool allows for money to be saved on energy and water bills. Money can be saved through the implementation of sustainable design elements such as recycled water, rainwater tanks, AAA rated shower heads and taps, landscaping, heat pumps or solar power heaters, gas space heaters, roof eaves/awnings and wall/ceiling insulation.

5.1.2 Land Use

The principle of land capability is fundamental to all land use planning. It refers to the potential use of land and its ability to achieve permanent and sustained levels of production. Proper consideration of land capability will alleviate the misallocation or misuse of land resources and the loss of potential highly productive land resources. Environmental problems such as soil erosion, increasing sedimentation of waterways, soil fertility decline and other forms of land degradation can result from land being used beyond its capability.

Land is classified according to the eight class system of the Soil Conservation System. This system classifies land into Land Capability Classes. The eight-class system identifies land as follows (Table 5).

This system is used by the Department of Lands NSW in the preparation of its 1:100 000 land capability maps. These maps show the maximum inherent capability of land for agricultural purposes and the level of protection necessary to prevent or control soil erosion and other types of land degradation. The aim of the classification and mapping is to identify the potential for land for broad land use and for recognizing the limitations of land. Desirably, a prime agricultural zone should be identified and protected by planning controls.

LAND CAPABLE OF BEING REGULARLY CULTIVATED
Class I No special soil conservation works or practices necessary
Class II Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotations
Class III structural soil conservation works such as diversion banks, graded banks and waterways, together with soil conservation practices as in Class II
LAND NOT CAPABLE OF BEING REGULARLY CULTIVATED BUT SUITABLE FOR GRAZING WITH OCCASIONAL CULTIVATION
Class IV Soil conservation practices such as pasture improvement, stock control, application of fertilizer and minimal cultivation for the establishment or reestablishment of permanent pasture
Class V Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices as in Class IV
LAND NOT CAPABLE OF BEING CULTIVATED BUT SUITABLE FOR GRAZING
Class VI Soil conservation practices including limitation of stock, broadcasting of seed and fertilizer, prevention of fire and destruction of vermin. This class may require some structural works
OTHER LANDS
Class VII Land best protected by green timber
Class VIII Cliffs, lakes or swamps and other lands incapable of sustaining agricultural or pastoral production

Table 4 - Land Capability Classes for Australia

Agricultural production is dependent on the use of land resources. The Inverell Shire contains large areas of prime agricultural land. The Inverell Shire is an important production area in New South Wales for crops such as wheat, barley and sorghum. The area also produces large quantities of beef cattle, sheep and pig products. Agriculture, forestry and fishing is the second largest industry sector employer (14.47 %) in the Shire (*ABS 2006 BCP*)

Most regular cultivation in the Inverell Shire occurs on land that has a capability from Class II to V, while most land used for grasslands has a capability from Class III to VI. However a lot of this land is used beyond its capability and as a result the land becomes vulnerable to degradation, particularly erosion. Hence the land in the Inverell Shire that has a capability of 7 or 8 has a lesser degree of erosion because it has not been used beyond its capability.

The Border Rivers – Gwydir Catchment Management Authority has implemented catchment targets for land capability and best practice and property plans and implementation as follows:

- ‘By 2015 an additional 15 000 hectares of land will be sustainably managed using industry agreed best management practices in accordance with the Land and Soil Capability System.’
- ‘By 2015, 1500 farmers will have developed property plans and at least 500 of these will have implemented improved farm management measures.’

The intent of the land and soil capability system target is to provide the CMA with the opportunity to increase the number of land managers using land within its capability as defined by the Land and Soil Capability System. Mapping of the region will assign a class to landscapes within the region. Each class will contain a list of activities that can reasonably be carried out on that soil type to ensure the land remains productive in the longer term.

The intent of the property planning target is to increase the number of resource managers developing and implementing integrated property management plans. The Border Rivers – Gwydir CMA will actively encourage landholders to record their plans to ensure an integrated approach to land management planning. Through integrated property planning landholders are better able to plan for the future and implement management that will benefit production and the environment.

The average farm size in the Shire is 650 hectares, although there are many smaller viable farms in more productive parts of the Shire. A range of agricultural production systems has been identified for the area. The major enterprises are:

- Specialist cropping (predominantly wheat, and also barley, chickpeas and sorghum in the summer)
- Mixed farming (grazing and cropping)
- Mixed grazing (sheep and cattle), and
- Light grazing with heavily timbered country
- Apiary industry
- Aquaculture

The Inverell area produces significant quantities of honey and is considered to be one of the largest producing areas in Australia. There are a number of viable aquaculture projects operating in the area and olive production and viticulture have also increased in the Inverell Shire. This increase in diversity of agriculture has resulted in the need to provide access to land for new types of agriculture, many of which do not require large areas.

Mining no longer occurs at the Conrad and King Conrad Silver Mines, however the area which includes the Howell township area, remains open for tours and fossicking. Malachite Resources own the land and began drilling for targets near the King Conrad mine in 2006. Further drilling began in early 2008 with the objective of increasing the resource base sufficiently to justify reopening the Conrad Mine. A Review of Environmental Factors (REF) was conducted for this area. The company also owns land at Elsmore and has commenced drilling at Newstead and Sheep Station Hill because exploration of the Elsmore Tin Mine resulted in inferior targets when compared to the other two areas. The Elsmore Tin Mine area was not sufficiently rehabilitated and because the majority of the trees were cleared overburden erosion has deposited sediment along with tree debris into the Macintyre River. This is common among all unrehabilitated derelict mines in the Inverell Shire, including the Gilgai – Stannifer – Mount Topper area and the Kings Plain/Elsmore/Swanbrook/ Nullamanna – Frazer's creek area.

CURRENT TITLES WITHIN INVERELL LGA AS AT 29th NOVEMBER 2012

Title No	Due Expiry	Last Renewed	Minerals
6587	03 July 2012	Renewal Sought	Group 9
7288	13 Feb 2013	22 Nov 2011	Group 2
7274	20 Jan 2013	06 Feb 2012	Group 2, Group 1
475	04 Sep 2012	04 Sep 2009	Petroleum
7302	23 Feb 2013	19 Dec 2011	Group 1
6511	02 Mar 2014	01 Nov 2014	Group 2
7734	06 May 2013	06 May 2011	Group 1
6947	21 Nov 2012	03 Mar 2010	Group 9
7301	23 Feb 2013	19 Dec 2011	Group 2
6433	15 Jun 2012	Renewal Sought	Group 9
1393	27 Mar 2015	01 Jan 0001	Sapphire
7287	13 Feb 2013	02 Nov 2011	Group 2, Group 1
6234	18 Apr 2011	Renewal Sought	Group 9
7894	06 Feb 2015	06 Feb 2012	Group 1
6196	18 Feb 2012	Renewal Sought	Group 1, Group 6
7900	14 Feb 2014	14 Feb 2012	Group 2
7277	30 Jan 2013	10 Jun 2011	Group 1, Group 2
7268	23 Feb 2012	27 May 2011	Group 2
6526	13 Mar 2011	Renewal Sought	Group 9
6946	21 Nov 2012	03 Mar 2010	Group 9
8005	31 Oct 2014	31 Oct 2012	Group 1
7858	02 Nov 2013	02 Nov 2013	Group 2
6521	09 Mar 2011	Renewal Sought	Group 9
3859	27 Mar 2015	01 Jan 0001	Sapphire
6428	16 Jun 2011	Renewal Sought	Group 9
7276	30 Jan 2013	11 Jul 2011	Group 1, Group 2
7278	06 Feb 2015	06 Feb 2012	Group 1
7290	13 Feb 2013	13 Feb 2009	Group 2
881	30 Sep 2013	07 Jan 2004	Sapphire, Zircon
437	06 May 2013	30 Jul 2010	Petroleum
6997	24 Dec 2014	19 Jun 2012	Group 2
7177	15 Jul 2012	Renewal Sought	Group 6, Group 1
7688	20 Jan 2013	20 Jan 2011	Group 6
7275	30 Jan 2013	02 Mar 2012	Group 1, Group 2
7892	06 Feb 2015	06 Feb 2012	Group 1
7562	04 Jun 2012	Renewal Sought	Group 6
6450	30 Jun 2011	Renewal Sought	Group 9

Table 5 - Current Mining Titles within Inverell Shire (Source: <http://nswtitles.minerals.nsw.gov.au/nswtitles/>)

The following State Forests are within the Inverell Local Government Area and cover 9502 hectares:

- Bebo State Forest
- Severn State Forest
- Parkhurst State Forest
- Clive State Forest
- Mount Topper State Forest
- Copeton State Forest
- Yetman State Forest

A summary of property sales for the Inverell Shire for the period 1998 to 2007 is the listed below:

Year	Total Sales	Number of Sales	Average Sale Price
1998	\$ 49,909,991.00	578	\$ 86,349.47
1999	\$ 53,712,785.00	585	\$ 91,816.73
2000	\$ 53,576,919.00	648	\$ 82,680.43
2001	\$ 81,691,288.00	705	\$ 115,874.17
2002	\$102,139,957.00	791	\$ 129,127.63
2003	\$131,721,822.00	878	\$ 92,300.31
2004	\$135,887,233.00	920	\$ 147,703.51
2005	\$126,901,618.00	731	\$ 173,600.02
2006	\$209,795,013.00	857	\$ 244,801.65
2007	\$165,049,059.00	573	\$288,043.73

Table 6 - Property Sales for the Inverell Shire, 1998 – 2007

A summary of property sales broken into zones for the period 1998 to 2007 is the listed below:

Year	Rural Sales	Number of Sales	Average Sale Price
1998	\$ 33,833,539.00	216	\$156,636.75
1999	\$ 31,086,435.00	217	\$143,255.46
2000	\$ 27,224,997.00	229	\$118,886.45
2001	\$ 47,620,227.00	235	\$202,639.26
2002	\$ 58,713,152.00	263	\$223,243.92
2003	\$ 81,039,676.00	300	\$270,132.25
2004	\$ 75,357,846.00	326	\$231,159.04
2005	\$ 67,346,638.00	240	\$280,610.99
2006	\$138,824,596.00	310	\$447,821.28
2007	\$ 98,696,165.00	207	\$476,793.07

Table 7 - Rural Property Sales for the Inverell Shire, 1998 - 2007

Year	Residential Sales	Number of Sales	Average Sale Price
1998	\$ 12,803,602.00	280	\$ 45,727.15
1999	\$ 16,612,900.00	287	\$ 57,884.67
2000	\$ 18,585,570.00	320	\$ 58,079.91
2001	\$ 25,041,256.00	354	\$ 70,738.01
2002	\$ 29,347,095.00	403	\$ 72,821.58
2003	\$ 39,301,333.00	448	\$ 87,726.19
2004	\$ 47,187,933.00	467	\$101,044.82

2005	\$ 47,832,279.00	391	\$122,333.19
2006	\$ 51,839,023.00	428	\$ 69,233.10
2007	\$ 50,976,419.00	278	\$183,368.41

Table 8 - Residential Sales for the Inverell Shire, 1998 - 2007

Year	Village Sales	Number of Sales	Average Sale Price
1998	\$ 1,329,850.00	50	\$ 26,597.00
1999	\$ 1,953,450.00	51	\$ 38,302.94
2000	\$ 2,844,251.00	68	\$ 41,827.22
2001	\$ 3,118,950.00	72	\$ 43,318.75
2002	\$ 3,668,700.00	81	\$ 45,292.59
2003	\$ 4,263,450.00	91	\$ 46,851.10
2004	\$ 4,199,501.00	79	\$ 53,158.24
2005	\$ 5,539,700.00	68	\$ 81,466.18
2006	\$ 5,054,016.00	73	\$ 69,233.10
2007	\$ 4,929,000.00	46	\$107,152.17

Table 9 - Village Property Sales for the Inverell Shire, 1998 - 2007

Year	Commercial Sales	Number of Sales	Average Sale Price
1998	\$ 1,086,500.00	18	\$ 60,361.11
1999	\$ 2,732,000.00	13	\$210,153.85
2000	\$ 4,019,000.00	12	\$334,916.67
2001	\$ 4,311,481.00	22	\$195,976.41
2002	\$ 8,618,510.00	19	\$453,605.79
2003	\$ 3,475,700.00	10	\$347,570.00
2004	\$ 4,883,070.00	19	\$257,003.68
2005	\$ 4,422,500.00	15	\$294,833.33
2006	\$ 7,260,132.00	18	\$403,340.67
2007	\$ 4,707,775.00	18	\$261,543.06

Table 10 - Commercial Property Sales for the Inverell Shire, 1998-2007

Year	Industrial Sales	Number of Sales	Average Sale Price
1998	\$ 756,500.00	12	\$ 63,041.67
1999	\$ 1,125,000.00	13	\$ 86,538.46
2000	\$ 903,101.00	15	\$ 60,206.73
2001	\$ 795,000.00	16	\$ 49,687.50
2002	\$ 832,500.00	18	\$ 46,250.00
2003	\$ 2,083,663.00	23	\$ 90,594.04
2004	\$ 3,258,883.00	27	\$120,699.37
2005	\$ 1,760,501.00	15	\$117,366.73
2006	\$ 3,876,833.00	23	\$168,557.96
2007	\$ 5,014,200.00	21	\$238,771.43

Table 11 - Industrial Property Sales for the Inverell Shire, 1998 - 2007

Year	Miscellaneous Sales	Number of Sales	Average Sale Price
1998	\$ 100,000.00	2	\$ 50,000.00
1999	\$ 203,000.00	4	\$ 50,750.00
2000	\$ -	4	\$ -
2001	\$ 804,374.00	6	\$ 134,062.33
2002	\$ 960,000.00	7	\$ 137,142.86
2003	\$1,558,000.00	6	\$ 259,666.67
2004	\$1,000,000.00	2	\$ 500,000.00
2005	\$ -	2	\$ -
2006	\$2,940,413.00	5	\$ 588,082.60
2007	\$ 725,500.00	3	\$ 241,833.33

Table 12 - Miscellaneous Property Sales for the Inverell Shire, 1998 - 2007

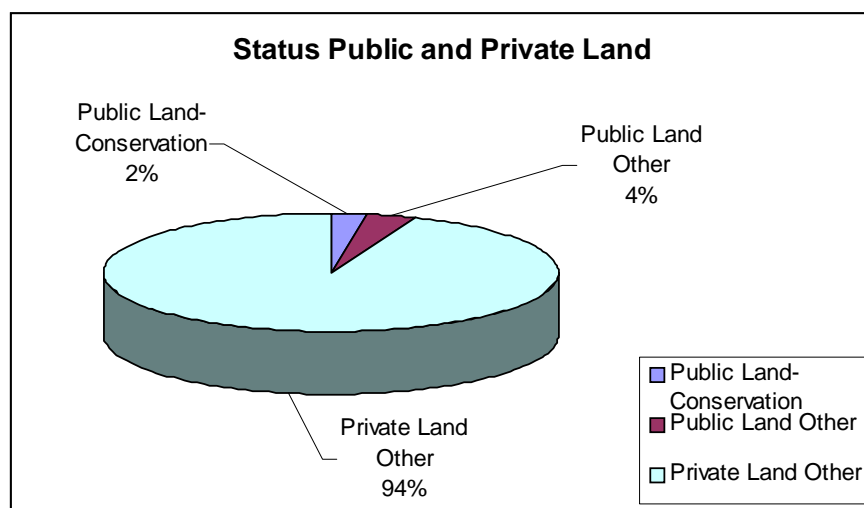
5.1.3 Environmentally Sensitive Land

The Inverell Shire has a number of areas that are protected and not suitable for development. These include National Parks, Nature Reserves, State Forests and wilderness areas. Through the Local Planning Instrument, Council has established Environmental Protection Zones which place restrictions on development within the area; however, agriculture is generally permissible throughout this zone.

Land with slopes greater than 18° is considered as liable to be affected by soil erosion and land degradation if subjected to inappropriate clearing and activities. These areas usually have shallow, infertile soils of low productive value and comprise mostly Class VII and VIII. The management of this land is considered important in protecting catchment health and good water quality.

The requirements of SEPP 44 and 46 and the provisions of the *Native Vegetation Act 2003* and *Soil Conservation Act 1938* provide greater control on development and cite certain instances where land is deemed to be protected. The *Inverell Yallaroi Regional Vegetation Management Plan* has identified areas within the Inverell Shire that are Protected Lands

Figure 5 - Public and Private Land Status



Note: Figure 6 has been derived from National Parks Estate, Forest Management Zones (in accordance with the Regional Forest Agreements), Public Land Data, Ramsar Data and State Environment Planning Policy Numbers 14 and 26. Private land conservation includes land under voluntary conservation agreements.

A number of areas comprising National Parks Estate lie within the Inverell Local Government Area. These areas include:

- Kings Plain National Park
- Severn River Nature Reserve
- Kwiambal National Park
- Arakoola Nature Reserve
- Goonoowigal State Conservation Area
- Dthinna Dthinnawan National Park and Nature Reserve Park
- Taringa Nature Reserve
- Nullamanna National Park
- Barayamal National Park
- Burrall Yurrul National Park

The total area of gazetted National Park estate lands contained within the Inverell Shire as above is 31 692 hectares.

Kings Plain National Park

Kings Plains National Park is located on the Northern Tablelands, approximately 50 kilometres north west of Glen Innes and 47 kilometres north east of Inverell. An area of 3143 hectares was formally reserved as the National Park in January 1988 and subsequent additions to the park brings the total area to approximately 6918 hectares.

Kings Plains National Park is located entirely within the Inverell LGA and is within traditional Ngarrabul Aboriginal country and the Anaiwan Local Aboriginal Land Council. Elevation within the park ranges from 690 metres above sea level to 1009 metres. Kings Plains Creek is a visually spectacular feature of the park with its associated deep rocky gorge, waterfalls and rapids.

Kings Plain National Park consists of open woodland vegetation of ironbark, cypress pine, yellow box, stringybarks, gums and apple box. There are many patches of heath containing uncommon or rare species including the grey guinea flower, Kings Plain homoranthus, folded leaf wax flower and Rodd's star hair. Native fauna include eastern grey kangaroos, wallaroos, swamp wallabies, red necked wallabies, koalas, rare bush tailed rock wallaby and platypus. A variety of native birds are also located at the park.

Kwiambal National Park

Kwiambal National Park was gazetted in 2000. Two major rivers, the Severn and the Macintyre meet in this park, which is located 90 kilometres north of Inverell. It has a gazetted area of some 6532 hectares and includes area from the former Arthur's Seat State Forest. The Park protects regionally important woodlands of white cypress pine, box, ironbark, riverine and also rainforests. There are over 140 bird species, along with grey kangaroos, wallaroos, red necked wallabies, and brush/ring tailed possums.

Severn River Nature Reserve

Severn River Nature Reserve is located on the western slopes of the New England Tableland, approximately 30 kilometres east of Ashford and 70 kilometres north of Inverell. The Reserve is dissected by the deeply incised valley of the Severn River, which also becomes the reserve boundary for approximately 12 kilometres. Pindari Dam adjoins the western section of the reserve. An area of 1924 hectares was formally reserved in 1968, with subsequent additions in 1998. The reserve currently has an area of 5750 hectares. Common tree species in the nature reserve include Black cypress (*Callitris endlicheri*), Orange Gum (*Eucalyptus prava*), *Eucalyptus caleyi*, Silver wattle (*Acacia neriifolia*), white box (*Eucalyptus albens*), Narrow leaved ironbark (*Eucalyptus crebra*), Tumbledown red gum (*Eucalyptus dealbata*), McKie's Stringybark (*Eucalyptus mckieana*), New England Blackbutt (*Eucalyptus andrewsii*), white cypress pine (*Callitris glaucophylla*), *Acacia leiocalyx*, Port Jackson fig (*Ficus rubiginosa*), long fruited bloodwood (*Corymbia dolichocarpa*) and River Oak (*Casuarina cunninghamiana*).

In 1992, the Pindari Dam downstream from the Reserve was enlarged to impound additional irrigation water in the Severn River. The reserve is bounded by private holdings and a crown land recreation reserve, located on the foreshores of the Pindari Dam and managed by Inverell Shire Council. The reserve is within traditional Kwiambal Aboriginal Country and is within the Ashford Local Aboriginal Land council Area. The reserve is located entirely within the Inverell Shire LGA.

Lake Inverell Reserve

Lake Inverell was formed by damming the Macintyre River, just upstream of Inverell. The dam wall was completed in 1938 to supply water to Inverell. Since 1983 town water has been piped from Copeton Dam, so Lake Inverell is now a wildlife refuge and recreation reserve. This popular reserve is managed by Inverell Shire Council.

Barayamal National Park

Barayamal National Park was established in 2006. It is special because it protects a very rare part of the original intact grassy white box woodlands now called the “wheat-sheep belt”. This woodland is part of only 15% of the original woodland left intact. The woodland ranged from Victoria to Queensland.

Despite its history of wood-cutting, grazing and use as a town tip, the 180 hectare Barayamal woodland is in good condition. In the past 50 years, many replacement trees have grown and the thick carpet of native grasses includes endangered species. Barayamal is an important area to manage and conserve native wildlife, especially the insects, birds and mammals that depend on grasses and seeds.

Barayamal is the local Aboriginal word for black swans, often seen on the Macintyre River and emblem of Inverell.

Goonoowigal State Conservation Area

The Goonoowigall Bushland Reserve was gazetted in 1976 as a Reserve for Public Recreation and preservation of Native Flora and has an area of approximately 900 ha. This conservation area covers 1055 hectares and parts of it have a flora and fauna reserve since 1920. It protects special wildlife in its Gum-Ironbark Woodlands, Blackbutt-Stringybark Woodlands and the endangered Howell Shrublands. Goonoowigall is a Jukumbal Aboriginal word meaning ‘wallaby rocks’. The reserve was created into a National Park in 2005 and management was transferred by a local trust to the National Parks and Wildlife Service.

Arakoola Nature Reserve

The Arakoola Nature Reserve was created in 1999 and covers 3180 hectares. There are thought to be 23 significant taxa and 450 plant species in the nature reserve. Seven significant communities are located within the reserve including:

- White box (*Eucalyptus albens*) and silver leaved ironbark (*Eucalyptus melanophloia*) basalt woodland
- Smooth barked apple (*Angophora leiocarpa*) and long fruited bloodwood (*Corymbia dolichocarpa*) sandstone woodland
- Smooth barked apple and red stringybark (*Eucalyptus macrorhyncha*) woodland
- Windmill grass (*Chloris truncate*) grassland
- Herbfield/sedgeland
- Red gum (*Eucalyptus camaldulensis*) and yellow box (*Eucalyptus melliodora*) riparian woodland
- Rough barked apple (*Angophora floribunda*) and weeping bottlebrush (*Callistemon viminalis*) riparian woodland

The Brigalow and Nandewar Community Conservation Act 2005

This act was gazetted 1 December 2005 and created the following National Park Lands within the Inverell Shire.

Barayamal National Park	Schedule One – Purpose Conservation and Recreation	This was crown land with an area of approximately 180 hectares.
Nullamanna National Park	Schedule Two – Purpose Conservation and Aboriginal Culture	This was previously known as Nullamanna State Forest and has an area of approximately 296 hectares.
Burrall Yurrul National Park	Schedule Two – Purpose Conservation and Aboriginal Culture	This was previously known as Bunal State Forest and has an area of approximately 1,037 hectares.
Dthinna Dthinnawan Nature Reserve Park and National Park	Schedule One – Purpose Conservation and Recreation	This was Minister Owned Land. The National Park and Nature Reserve are very close in proximity and were listed together. Combined they have an area of 5,402 hectares. Includes land from Bebo State Forest.
Goonoowigal State Conservation Area	Schedule One – Purpose Conservation and Recreation	This was crown land with an area of approximately 1,055 hectares.
Taringa Nature Reserve		Approximately 1342 ha.

Table 13 - National Parks Lands within the Inverell Shire under the *Brigalow and Nandewar Community Conservation Act 2005*

The objects of this Act are:

- a) to reserve forested land in the Brigalow and Nandewar area to create a Community Conservation Area that provides for permanent conservation of land, protection of areas of natural and cultural heritage significance to Aboriginal people and sustainable forestry, mining and other appropriate uses, and
- b) To give local communities a strong involvement in the management of that land.

GWYMAC Inc

GYWMAC Inc is an umbrella group for Landcare groups, and stands for Gwydir and Macintyre Resources Management Committee. It works closely with Landcare groups in the area covered by the Inverell Shire and Border Rivers – Gwydir CMA. The goal of GWYMAC is:

- To develop a healthy ecosystem to generate wealth that will sustain the future needs of the people of the region.

- To work with the issues of natural resource management in the Gwydir – Macintyre catchments.
- To educate landholders on sustainable practices and encourage the uptake of these practices.

5.1.4 Floodplain Management

Since 1864 more than 24 floods have been recorded at Inverell. Four (4) floods (1872, 1955, 1976 and 1991) caused considerable property damage and disturbance. Parts of the town of Inverell experience flooding from time to time. The Central Business District (CBD) is located on the floodplain and is a major area affected by flooding, whilst adjoining industrial and residential areas and the Black Flat area are also affected, depending on the height of the flood.

During the 1991 flood, a number of problems were highlighted including uncertainty regarding advance warnings issued to landholders and confusion among some sectors of the community regarding the significance of reported river levels at the Ross Hill Gauge. According to the Inverell Floodplain Management Plan, the cost of the February, 1991 flood in Inverell was some \$20.5 million. As highlighted by the historical floods, problems with mainstream flooding in Inverell have been caused in part by the development of areas that would have better been reserved as floodways or open space areas when the area was first settled.

Much of the Inverell CBD is classified as high hazard flood fringe under designated flood conditions but will become high hazard floodway fairly quickly in large floods. The following is a summary of the outcomes of the Inverell Floodplain Management Plan:

General

- Council has completed consultation with the Inverell SES and further improvements will be made to the flood warning system to increase both warning time and accuracy of forecasts
- An ongoing public education program is currently being implemented in conjunction with the Inverell SES to ensure that the public are aware of procedures to be followed when flood warnings are issued
- The Emergency Operations Centre has been relocated to Burtenshaw Road which is an area above the level of the 0.02% AEP floods (5000 year ARI)
- Safe assembly areas have been identified by Inverell SES for the purposes of evacuation
- Modified building and development controls have been implemented through amendments to DCP No. 5 to control all new development
- In conjunction with Inverell SES, flood emergency plans are being prepared by owners/occupiers detailing procedures to be followed in the event of flood warnings to be issued

Floodways

At Inverell, the main river channel including some of the lower over bank areas were categorised as floodway. It was proposed that:

- Floodways have been reserved permanently for the conveyance of floodwater
- The crossing of a floodway by services of major regional significance will be permitted provided they are carefully investigated and designed so as not to affect flood behaviour significantly
- Building and/or filling in floodways is not permitted

- Fencing which would collect debris or otherwise hinder flood flows or reduce flood storage is prohibited
- Current re-vegetation of the river banks and riparian verges is being undertaken to conform to planting guidelines consistent with those outlined in the Plan

The Plan also identified specific issues and properties to be addressed within the CBD Floodplain Management Area, the Black Flat Floodplain Management Area and the Edward Street Floodplain Management Area. As a result of this, levels have been set for habitable floor levels, voluntary flood protection measures have been implemented for commercial premises and voluntary purchase or house-raising programs are in place.

The majority of the report's recommendations have been implemented. This includes various construction works and a voluntary house-raising program. Ongoing maintenance work is required to be carried out on drainage installations to ensure that they are free of weeds and blockages and will allow for maximum water flows during storm and flood events.

Council has in place a Floodplain Management Plan, which addressed numerous aspects to be implemented to help minimise the affects of flooding on the town. The plan is based on the effects of known floods and the results of computer modeling and engineering design. The plan has been prepared due to the following:

- The constant threat of flooding.
- The need to maintain all physical mitigation measures.
- The need to maintain awareness readiness & capacity of emergency organisations to respond to flood events.

3.3 Border Rivers-Gwydir Catchment Management Authority (CMA)

The NSW Government established thirteen Catchment Management Authorities (CMAs) across the State as part of broad natural resource management reforms. This new approach to natural resource management resulted from recommendations in October 2003 by the Native Vegetation Reform Implementation Group (NVRIG) chaired by the Right Honourable Ian Sinclair AC.

NVRIG was formed to identify the ways to improve the management of native vegetation in NSW. NVRIG considered the environmental, economic and social impact of current and previous land management policies and regulations. It then recommended a comprehensive suite of reforms to ensure a viable and sustainable State for current and future generations. The NSW Government welcomed the NVRIG report and used the recommendations as a basis for sweeping natural resource management reform in NSW.

The Authorities were established under the *Catchment Management Authorities Act 2003*, which came into force on 23 January 2004. The Border Rivers-Gwydir CMA incorporates all of Inverell Shire (Figure 7). The Border Rivers-Gwydir Catchment occupies an area of approximately 50,000 square kilometres. The principal rivers that drain the inland slopes of the eastern highlands are the Dumaresq, Severn and Macintyre. The Gwydir River is located in the south west of the Catchment.

The Border Rivers-Gwydir CMA services the entire Gwydir Catchment (approx 26,500 square kilometres) and the NSW portion of the Border Rivers Catchment (approx 24,000 square kilometres). Both of these catchments are located within the Murray-Darling Basin. They are bounded by the Queensland border in the north and west, the Great Dividing Range in the east and the Namoi Catchment in the south.

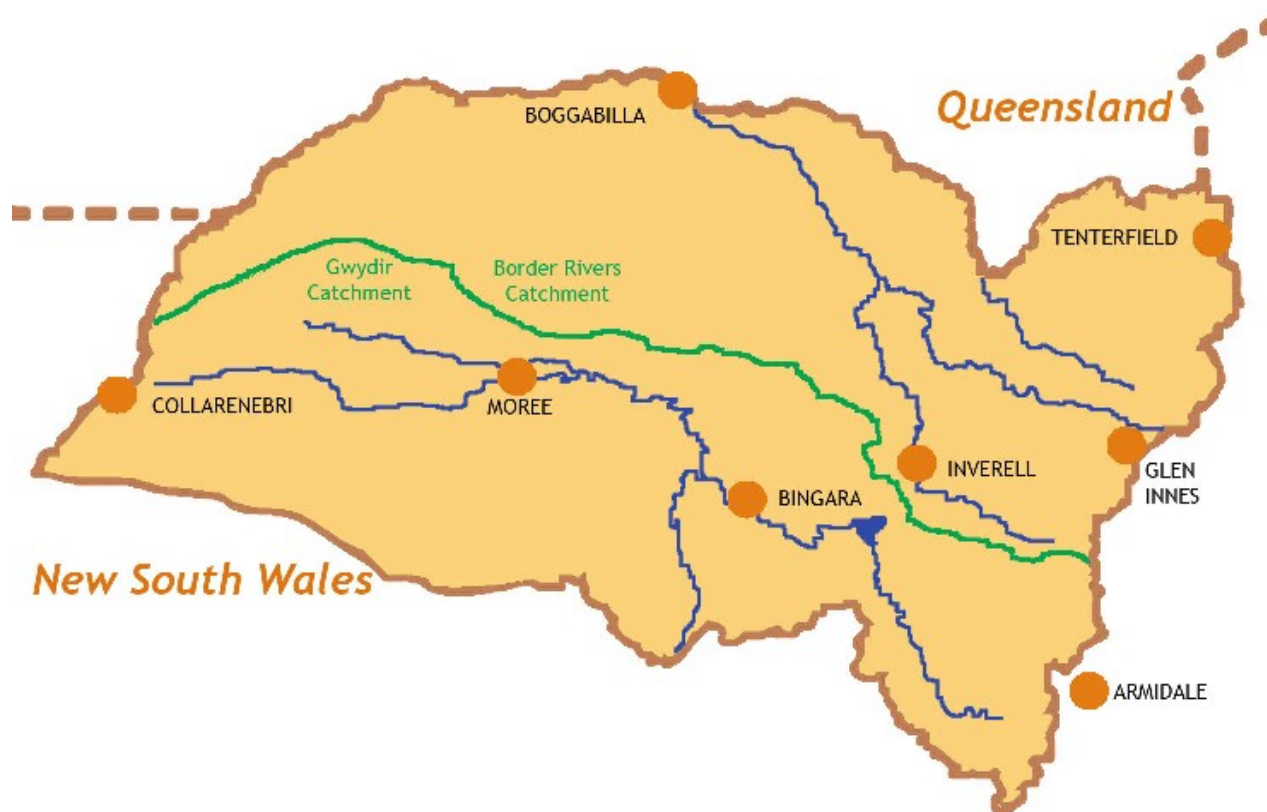


Figure 6 - Border Rivers - Gwydir Catchment Management Authority Area

CMAs are statutory authorities, with responsible and accountable Boards that report directly to the Minister for the Department of Environment and Climate Change. Each CMA Board consists of a Chairperson and up to six Board Members with all appointments being skill and merit based.

While CMA's are a new initiative of the NSW Government to manage natural resources they build on work previously undertaken by the Catchment Management Boards (CMB's) and Regional Vegetation Committees. They also integrate the Catchment Blueprints developed by the CMB's and endorsed by the NSW and Commonwealth Governments, into their Catchment Action Plans (CAP's). The CAP is reviewed annually so that new information and science can be incorporated into the CAP as on - ground investment takes effect and is monitored and evaluated.

The Border Rivers-Gwydir Catchment Management Authority (CMA) aims to ensure the protection and sustainable management of land, vegetation and water resources within the catchment. The CMA exists to help landholders, farmers and the broader community sustain and manage natural resources in the catchment. The main natural resource areas they cover are:

1. vegetation and biodiversity management
2. salinity prevention and management
3. rivers and wetlands management
4. soils and land management

The specific functions of CMA's include:

- planning and investment
- native vegetation

- water
- on ground works
- community engagement

Their role is to engage regional communities in the key natural resource management issues facing their catchments. They are the primary vehicle for the delivery of incentive programs funded by both the State and Commonwealth Governments to achieve restoration and improvements in natural resources. The CMA is committed to meeting the needs of landholders, community members and Landcare. Funding has been received for the completion of large on ground works in the Inverell Shire which has been a positive step for ensuring degradation and the ecosystems involved are improved. Unfortunately a lot of land in the Inverell Shire is still used beyond its capability and requires more landholder education and funding to ensure the land is made and remains sustainable. The area east of Inverell is considered to be a high priority zone as the land has been used beyond its capability for a long period of time and requires large amounts of work and funds to rectify the land degradation and loss of biodiversity that has occurred.

4 AIR

4.1 Air Quality

The Shire did not receive or experience any associated problems in the reporting period regarding air pollution or the like. The air quality in the Inverell Shire as a whole is expected to be very good because of the lack of heavy industry or concentrated urban areas. However, there are no routine air quality measurements taken so it is not possible to make a definitive statement for the Inverell Shire. The most usual air quality issue in regional areas is fine particle dust pollution from uncovered and ploughed paddocks. The Inverell Shire Council's main responsibilities in regards to air quality pollution are small businesses, domestic premises and urban planning. The council uses Local Environment Plans (LEP's) to plan land use and control new developments.

The main sources of carbon monoxide are motor vehicles, bushfire hazard reduction burnoffs, and residential solid fuel fires. Carbon monoxide concentrations are generally highest on winter evenings because of emissions from vehicle usage and a surge in wood-burning heaters starting to operate as people return home. Concentrations can build up and the pollutant may be temporarily trapped by atmospheric inversions which are most common on clear winter evenings.

The Inverell Shire Council is equipped with legislation and regulations for clean air under the *Protection of the Environment Operations Act 1997*. The *Environmental Planning and Assessment Act 1979* and the *Local Government Act 1993* provides Inverell Shire Council with alternate legislation to ensure that air quality in the region is managed correctly and to reduce the impact of pollution.

4.2 Air Borne Disease's

No notifiable outbreaks or reports of any air transmitted diseases during the reporting period were received by Council.

4.3 Dust

Council did not receive any major complaints regarding the generation of dust during the reporting period. Several minor incidents of dust generation were raised between adjoining property owners. Council liaised with all effected parties to reach the result to satisfy all owners. Council ensures dust does not affect neighbouring properties with construction and/or demolition by providing appropriate conditions of approval.

4.4 Odour

Odour is subjective and affects residents located within a radius of residential premises. Intensive agriculture, sewage treatment plant, solid waste landfill facilities and other industries can at times produce offensive odours usually dependent on prevailing winds or the season.

5 WATER

5.1 Water Quality

Wetlands and rivers are natural resources that are intricately connected to other elements of the landscape. Declining wetland and river health reduces the capacity of natural processes to:

- purify water;
- recharge underground aquifers;
- store water and slow down floodwaters;
- provide critical habitat for birds, fish, amphibians, mammals and reptiles during times of drought;
- provide important habitat for migratory birds that fly to Australia
- stabilise shorelines and riverbanks;
- support sustainable populations of threatened species;
- cycle nutrients.

Some of the environmental, social and economic effects associated with declining river and wetland health are as follows to illustrate the broader significance for sustainability. A decline in the health of floodplain and estuarine wetlands decreases habitat for native fish breeding and can affect fish stocks and diversity in freshwater and coastal ecosystems. They are critical for the supply of our water and are sites for industry, recreation and tourism. Wetlands improve water quality, help mitigate floods and stabilise riverbanks. Recreational and commercial fishing, boating, bird watching, camping and other nature-based activities and associated industries rely on healthy wetlands and rivers resulting from the adequate provision of water to the environment. A decline in the health of these habitats can result in inadequate supplies of water for human consumption, depleted resources for fishing industries, decreases in tourism and restricted or lost access for boating.

The social impact of declining health in these and other wetlands include:

- a) fewer places to enjoy and study plants and animals in wetlands;
- b) the potential extinction of species that could be sources of medicine and other resources;
- c) fewer places for nature-based tourism;
- d) the loss of biodiversity assets for the benefit and pleasure of future generations

The Border Rivers – Gwydir Catchment Management Authority has implemented targets for water quality and related issues as follows:

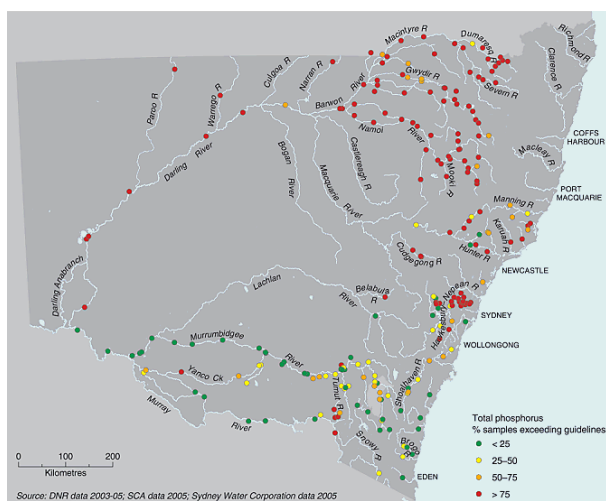
- By 2015, water quality in all sub catchments is maintained or improved to ensure that the quality of the water is consistent with the ANZECC and ARMCANZ trigger values for aquatic ecosystem protection 80 % of the time
- By 2015 manage and protect riparian areas to improve vegetation conditions and establish vegetation in and additional 500 kilometres of riparian zone in strategic priority locations
- By 2015 maintain or improve the condition of 500 kilometres of land comprising or influencing wetlands, with priority given to regionally significant wetlands and Ramsar listed sites.

The intent of the water quality target is to achieve water quality that can protect agricultural production and the environmental, social and cultural heritage values of riverine ecosystems within the region. Trigger values are those at which there is a risk of adverse biological effects. The poorest water quality generally occurs at the bottom of each catchment. Turbidity increases progressively downstream. Total phosphorous concentrations are high in both catchments. Priority management actions will include developing an education and awareness programme on ways to improve water quality, reduce the use of fertilizers and herbicides and improving the flow of waterways by the use of appropriate native vegetation on streambanks.

The intents of the riparian vegetation target is to prevent further damage to the riparian zone and protect the aquatic environment by stabilizing riverbanks and improving ecosystem function. Where native riparian vegetation currently exists and reflects a near natural state, it should be maintained. It is important that any Revegetation or regeneration of native vegetation in riparian areas is appropriate and achieves the target's objective. Actions to achieve this target will include additional native vegetation being established that is appropriately diverse in species and structure and is endemic to the local area. Native vegetation will be established in strategic areas where it will link existing vegetation or increase the area, and therefore the viability of existing remnants.

The intent of the wetland target is to protect wetlands in the region from degradation arising from insufficient water, weeds, poor water quality and land management practices that affect the ecological values of these systems. Some of the actions that could be carried out on land influencing wetlands to improve their condition would be the removal of weeds and feral pests, reductions in the use of fertilizer and herbicide, restoring normal water flows and reducing erosion.

Nutrients are a significant water quality issue when they are in excess in waterways. Excess phosphorous and other nutrients leads to eutrophication of waterways (see Map 5). Eutrophication of waterway encourages the growth of algal blooms, often cyanobacteria at Copeton Dam, which leads to a reduction in the dissolved oxygen available for water organisms and so fish fatality may occur.



Map 5 - Percentage exceedences of total phosphorous levels compared to guideline levels at NSW sites

Microbiological sampling occurs weekly at Inverell, fortnightly at Ashford and monthly at Yetman. Samples are submitted to the Division of Analytical Laboratories which in turn provide the results both to the Department of Health and Council. Chemical sampling is undertaken daily by Council staff.

5.2 Urban Runoff

During 2000, Council prepared and implemented a Stormwater Management Plan (SMP). The purpose of the SMP is to:

- Increase community awareness, education and interest in the importance of storm water catchment and the importance of a SMP
- Improving storm water quality
- Minimising the impact on aquatic and terrestrial habitats associated with the Inverell urban storm water system
- Reducing impacts of erosion on natural habitat and its impact on water quality
- Improving the overall aesthetics of the storm water system
- Minimising the impact of health and safety issues of the community in association with storm water system
- Addressing relevant planning and flooding issues within the urban catchment
- Ensuring that storm water management is at reasonable costs

This plan is being used as a reference for on-going management of storm water issues.

5.3 Groundwater

Groundwater is an important and vital natural resource in NSW. It is coming under increasing pressure to meet human uses for agriculture and industry, as well as drinking water for many country towns. Groundwater systems in NSW which have been classified as being at high risk from over-extraction or from contamination or both are being given priority for management action. Water sharing plans which include environmental water rules are being set. To ensure that over - extraction does not occur water licenses have been bought back off landholders to reduce the strain on the groundwater supply. The Water Sharing Plan was designed to span ten years and ensure that water entitlements are reduced to 100 % of the sustainable yield.

Key areas of NSW have been mapped by DECC to help to identify locations where the risk of contamination of groundwater is greatest. These maps are a guide to strategically locating future developments, so as to minimise their impact on the groundwater resources within specific catchments. With the increasing demand for reliable sources of water suitable for drinking, groundwater is commonly sought to meet the current and future needs of communities in NSW. Would cut this if can't find map.

Groundwater can provide a high quality, reliable, and secure water supply. Although it is usually less likely to be contaminated than surface water, inappropriate land use practices can pose a risk. Once groundwater is contaminated it is extremely difficult to restore it to its initial purity level.

Groundwater vulnerability assesses the susceptibility of the underlying groundwater resource to contamination from surface activities. Almost all groundwater resources are vulnerable to some degree; however, some are more vulnerable to contamination than others. Groundwater vulnerability maps provide a convenient way of displaying the relative vulnerability of a groundwater resource within a catchment. According to the Department of Water and Energy, there are areas of high vulnerability ranked groundwater resources found predominantly in the unconfirmed, shallow, highly permeable locally recharged alluvial aquifers associated with major rivers, including the Dumaresq River downstream of Glenlyon Dam, the Severn River up and downstream of Ashford and its tributaries in the upper catchment around Glen Innes, as well as the alluvial section of the Macintyre River up and downstream of Inverell. There is moderate – moderately high groundwater vulnerability around Inverell, Glen Innes and east of Ashford.

5.4 Local Government Border Rivers Project

The aim of the project is to conserve water by the erection of dams or any other means of water conservation in this area of the Darling River and its tributaries, and to consider the benefits of implementing small scale hydroelectric generation where appropriate and economically feasible on existing or new developments. The area covered by the group consists of areas or parts thereof, of local governments in Queensland and New South Wales which border on the QLD-NSW state boundary and whose rivers flow into or are tributaries of the Darling River system.

5.5 Surface Water and Groundwater Salinity

The salinity levels of the Murray Darling Basin were measured from 1975 – 1995. The salt yields in the Border Rivers – Gwydir catchment were <1 tonne/km²/annum, which was the lowest category for NSW.

5.6 Water Supply and Treatment

The Inverell Shire Council operates three separate water supply schemes for Inverell, Ashford and Yetman.

The Inverell water supply scheme also provides services to the villages of Gilgai, Delungra and Tingha, together with rural allotments between the town and villages within connection range. Water is sourced from Copeton Dam. Copeton Dam has a holding capacity of 1 364 000 ML and was at approximately 50 % on 30 June 2011. Copeton Dam can be afflicted with pollution problems such as cyanobacteria blooms; however the water can still be used for domestic use with correct treatment.

Water is pumped to the Ashford treatment works from the Severn River and it then gravitates to the village.

A bore is located in Inverell Shire Council's Yetman Depot and it provides water for reticulation throughout the village.

Council provides a potable water supply in Inverell through the management of the water treatment plant which is located on the Minnamurra Road approximately 7 kilometres, south west of the centre of Inverell. The plant uses a system of coagulation, sedimentation and filtration to treat the raw water supply. Approximately 48 megalitres of storage is provided by a series of steel and concrete storage tanks located within the town of Inverell.

Annual production is approximately 1800 megalitres, with the major consumer being Bindaree Beef (an operating abattoirs) which utilizes approximately 400 megalitres per annum.

The water produced complies with the Australian Drinking Water Guidelines. Compliance testing is undertaken in accordance with the guidelines set by the Department of Health and the Department of Environment & Climate Change. Discharge of waste waters arising from the treatment plant complies with the Department of Environment and Climate Change guidelines.

5.7 Copeton Dam

Copeton Dam has a major impact on wetlands downstream of its location. Historically 70 000 hectares downstream of Copeton Dam were covered with wetlands but after the construction of the dam wetlands covered less than 5% of their original area. As a result environmental flows were planned to pass through the Gwydir Wetlands. The amount was determined to be the lesser of 500 ML/day or the sum of flows in the Horton River at Rider, Myall Creek at Malroy and Halls Creek at Bingara, plus any water spill or pre release for flood mitigation purposes from Copeton Dam water storage. A release of 250 ML/day is required to maintain bird species dependent on the wetland ecosystem and environmental flows.

There are 86 000 hectares licensed for irrigation in the catchment that are provided for by Copeton Dam. Water tested downstream of Copeton Dam usually has low electrical conductivity (EC) because the amount of water released dilutes the saline water. The median total nitrogen (TN) exceeds the ANZECC and ARMCANZ guidelines for protection of aquatic ecosystem (0.6 µg/mL) within pre-watering and irrigation flow phases but they do meet the guidelines for irrigation water. The median total phosphorous (TP) also exceeds the ANZECC and ARMCANZ guidelines for protection of aquatic ecosystems and irrigation waters (0.05 µg/mL). These levels are significantly higher during the pre – watering and irrigation phases. Commonly TN and TP levels are higher downstream of Copeton Dam than upstream of Copeton Dam. Increasing the flow results in an increase in the actual volume of salts and nutrients (that is, load).

6 BIODIVERSITY

Biodiversity is the systematic interaction of all life forms (plants, animals and micro organisms) and it is this interaction that is essential to sustain our communities. Our involvement with this ecosystem should be conducted in a manner that ensures the long term health of the ecosystem.

A healthy, biodiverse environment is necessary to maintaining water quality, air pollution, soil formation and plant regeneration. Human activities that seek to facilitate the operation of this biodiverse environment will result in a more comfortable place to work, live and visit.

Considering these factors, the following management principles will be utilized by Council

- consider vegetation as a key indicator of catchment health and land use management
- protection of remnant vegetation, retention and improvement of wildlife corridors and protection of wetlands and key focus areas.
- Foster behavioural change in vegetation and biodiversity management across the community
- Include fire management and weed control as part of vegetation and biodiversity management planning.

6.1 Fish Species

NSW Fisheries (DPI) has submitted the following information for the reporting period.

6.1.1 Endangered Fish Species

1. *Notopala sublineata* River Snail



Figure 7 - River Snail Shell

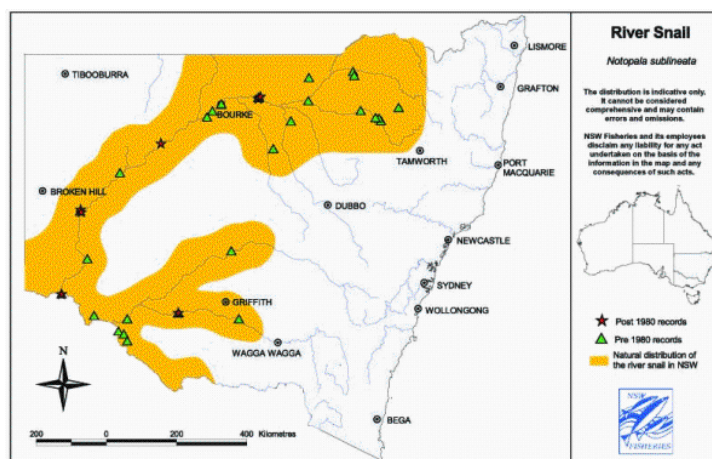


Figure 8- Distribution of *Notopala sublineata*

There are approximately 18 *Notopala* species found in Australia, mostly in northern Australia. Only two of these – the endangered ‘river snail’ *N. sublineata* and the species *N. suprafasciata* – occur in the Murray-Darling system. Both have undergone major declines in recent decades and are now very rare. These two species can be distinguished by the fact that *N. sublineata* is smaller (growing to ~2.5-3.0 cm) and does not have diffuse spiral bands on the shell.

N. sublineata consists of three sub-species, which until recently were considered separate species. *N. sublineata hanleyi* is restricted to the Murray and Murrumbidgee drainages, and *N. sublineata sublineata*

to the Darling River and its tributaries. A third subspecies has a wide distribution in more northern inland and coastal drainages, outside of NSW.

6.1.2 Endangered Fish Populations.

1. *Mogurnda adspersa* purple spotted gudgeon.



Figure 9- Purple Spotted Gudgeon

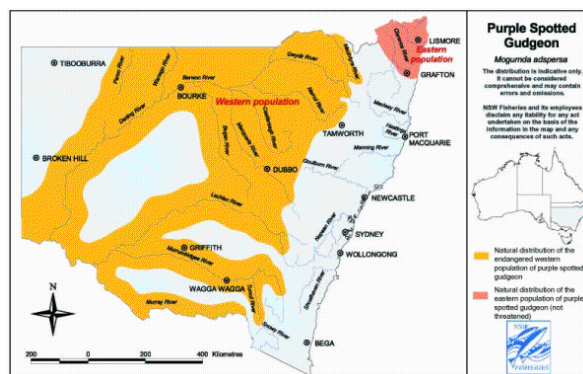


Figure 10 - Distribution of *Mogurnda adspersa*

Purple spotted gudgeons occur in inland drainages of the Murray-Darling basin as well as coastal drainages of northern NSW and Queensland.

The western population of the purple spotted gudgeon was previously widespread in the Murray, Murrumbidgee and Lachlan River systems and tributaries of the Darling, but has experienced a significant decline in recent times. Purple spotted gudgeons are now extremely rare in inland NSW, having been recorded from this area only once since 1983.

The western population of the purple spotted gudgeon is listed as an endangered population in NSW. There are heavy penalties for harming, possessing, buying or selling them, or for harming their habitat.

2. *Ambassis agassizii* Olive Perchlet

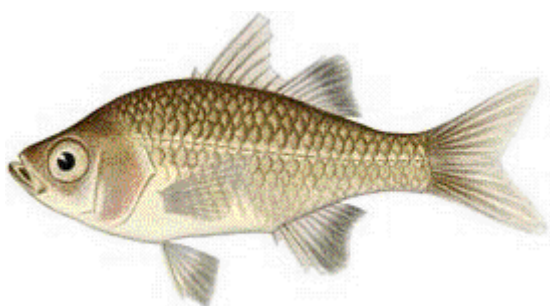


Figure 11 - Olive Perchlet

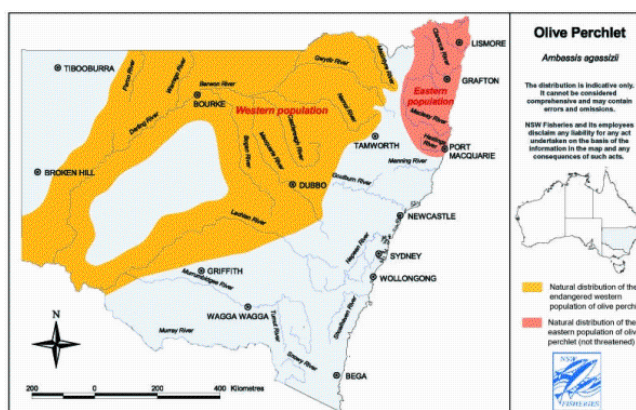


Figure 12 - Distribution of *Ambassis agassizii*

Olive perchlets are a small native fish that occur in both eastern (coastal) and western (Murray-Darling) drainages, but these populations may be genetically distinct.

The western population of the olive perchlet was once widespread throughout the Murray-Darling system of South Australia, Victoria, western New South Wales and southern Queensland. This population has suffered a serious decline and is now found only at a few sites in the Darling River drainage. The species is extinct in Victoria and has not been found in South Australia since 1983.

The western population of the olive perchlet is listed as an endangered population in NSW. There are heavy penalties for harming, possessing, buying or selling them, or for harming their habitat.

6.1.3 Vulnerable Fish Species.

1. *Bidyanus bidyanus* silver perch

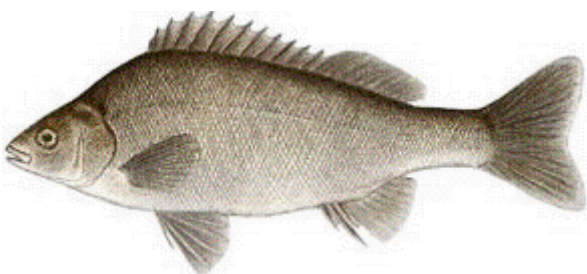


Figure 13 - Silver Perch

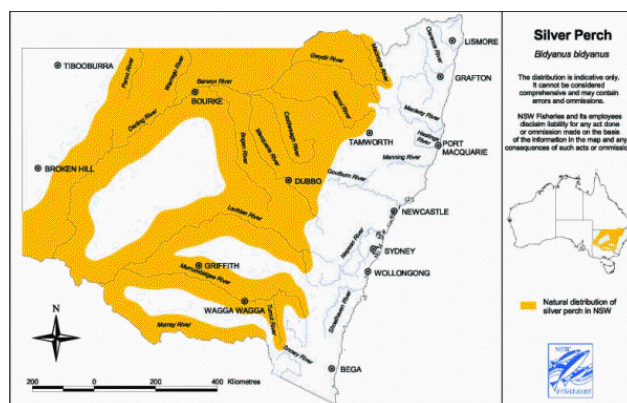


Figure 14 - Distribution of *Bidyanus bidyanus*

Silver perch, also known as bidyan or black or silver bream are a moderate to large freshwater fish native to the Murray-Darling river system. They were once widespread and abundant throughout most of this area, except for cooler high altitude streams. However, they have now declined to low numbers or disappeared from most of their former range.

Silver perch are now successfully bred for aquaculture, conservation and to enhance recreational fishing, and large numbers have been stocked into impoundments and smaller numbers into rivers in the Murray-Darling Basin. However, in most cases stocking of silver perch has not managed to establish reproducing populations, and they are still considered under threat in the wild.

Silver perch are listed as a vulnerable species in NSW. There are heavy penalties for harming, possessing, buying or selling them, or for harming their habitat. While it is prohibited to take silver perch from rivers or streams in the Murray-Darling Basin, it is still legal for anglers who comply with the recreational fishing rules to catch and keep silver perch from some stocked impoundments and private dams. Harvesting silver perch from fish farms is also still permitted.

For further info log on to www.dpi.nsw.gov.au/fisheries

In general, fish community health is excellent to good along the Macintyre River; however there are some regions that have poor fish community health (Map 6).

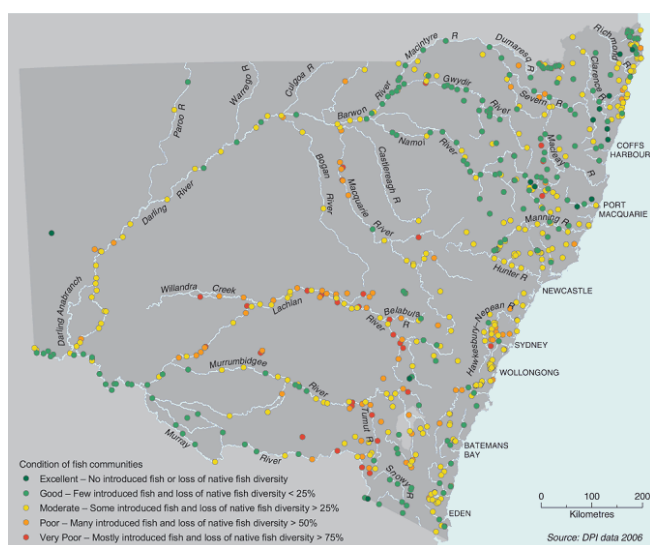
The Border Rivers – Gwydir Catchment Management Authority has implemented a target to ensure that aquatic biodiversity is not reduced in the local ecosystems,

‘By 2015 maintain or improve native aquatic biodiversity by improving the condition of 100 kilometres of stream in strategic priority locations.’

The intent of the aquatic biodiversity target is to ensure that all native aquatic biodiversity is protected. It specifically focuses on aquatic biodiversity found naturally within the catchment. It is important that the movement of fish and other aquatic animals is unimpeded. Projects that will be included in this target will focus on:

1. Managing in stream structures which modify flow and create barriers to movement,
2. Reinstating and managing large woody debris, reversing the degradation of riparian vegetation and management of pest species,
3. Identification of high conservation areas and recovery priorities, and
4. Habitat protection and rehabilitation.

The target aims to conserve threatened and vulnerable species, populations and communities including silver perch, river snail and the western populations of the olive perchlet and purple spotted gudgeon and the endangered ecological community of the Lowland Catchment of the Darling River.



Map 6 - Health of the fish community

6.1.4 Endangered aquatic ecological communities.

On the 4 July 2002 the endangered aquatic ecological community of the lowland Darling River was gazetted under the *Fisheries Management Act 1994*. This ecological community refers to all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow inversions to anabranches, the anabranches and the floodplains of the Darling River within NSW. The endangered ecological community includes the Border Rivers such as the Macintyre River below Graman Weir, Severn River downstream of Pindari Dam and the Dumaresq River below the junction with the Mole River.

6.1.5 Key threatening processes that occur in Inverell LGA.

Key threatening processes (KTP) listed under Schedule 6 of the *Fisheries Management Act 1994* that have impacted or, continue to impact on waterways in the Inverell Shire include:

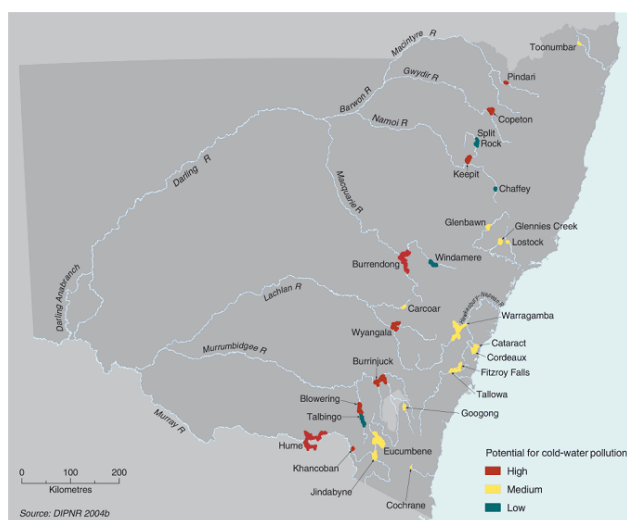
- The introduction of fish to fresh waters within a river catchment outside their natural range.
- The removal of large wood debris from NSW rivers and streams
- The degradation of native riparian vegetation along NSW water courses

- Installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams
- Hook and line fishing in areas important for the survival of threatened species

6.1.6 Significant fish habitats that occur in Inverell LGA.

Important fish habitats that occur include: floodplain areas, riparian vegetation, in-stream aquatic vegetation, snags, gravelbars, and over hanging banks. The natural variability of flows that occur in rivers and creeks is very significant as in addition to providing ecological triggers for a number of species different flow events make different habitats (such as the floodplain during floods) available for fish.

Copeton Dam causes relatively large and pervasive cold water pollution (CWP) (Map 7). Out of all dams in NSW Copeton causes the greatest overall disturbance because water is drawn from deep in the dam and released in large volumes during summer. Severe CWP occurs when water is drawn from > 10 metres and if ≥ 1000 ML is released and this is a common occurrence at Copeton. It has been estimated that serious CWP persists for 300 kilometres below the dam (defined at > 5° peak depression).



Map 7 - Potential impacts of NSW large dams releasing cold water

6.1.7 Number of Potential road crossing barriers to Fish.

The number of potential road crossings barriers to fish is unknown however, it is anticipated that Council will be co operating with NSW Fisheries (DPI) in the near future in a project to identify and prioritise for remediation projects.

The impact of road crossings on fish passage will vary depending on:

- The design of the structure
- The nature of flow, debris, and sediment movement in the waterway
- The swimming capabilities of resident fish

Bridges that are built too low, or whose piers and footings constrict the channel can affect hydrological flows and aquatic habitat conditions. Culverts can restrict fish passage by increasing flow velocities and turbulence, and reducing flow depth through the structure. Often fish will not enter culverts, and debris can physically block fish passage.

Fish passage barriers can adversely impact native fish by:

- Interrupting spawning or seasonal migrations
- Restricting access to preferred habitat and food resources
- Increasing the chance of predation and disease
- Reducing genetic flow between populations through population fragmentation

6.1.8 Council's responsibilities under Parts 7 & 7A of the Fisheries Management Act

Part 7 of the Fisheries Management Act

Council must not carry out, or grant approval to carry out, an activity (within the meaning of Part 5 of the *Environmental Planning and Assessment Act 1979*) within an aquatic reserve unless the determining authority has:

- (a) Taken into consideration:
 - (i) The objects of this Act specified in section 3, and
 - (ii) if a management plan for the aquatic reserve has been made under section 197A, the objectives of the aquatic reserve, and
 - (iii) the permissible uses of the area concerned under this Act, and
- in the case of an activity for which an environmental impact statement is required to be prepared under Division 3 of that Part, obtained the concurrence of the Minister to the carrying out of the activity or the granting of approval.

Part 7A of the Fisheries Management Act – Threatened Species Conservation

Council must not carry out, or grant approval to carry out, development or an activity of a specified type constitutes, that is likely to significantly affect threatened species, populations or ecological communities, or their habitats. Council is to undertake all consultative actions prescribed including undertaking species impact statements. All integrated development applications are referred to the appropriate government authorities for comment prior to any approval being issued. If Council is aware that there may be matters which can affect threatened species advice is requested.

6.2 The Threatened Species Priorities Action Statement (PAS)

The Threatened Species Priorities Action Statement (PAS) outlines the broad strategies and detailed priority actions in NSW to:

1. promote the recovery of threatened species, population and ecological communities
2. manage key threatening processes.

The PAS provides a comprehensive and strategic approach to threatened species recovery and threat abatement. It is to be reviewed every three years with input from the Natural Resources Commission, the Scientific Committee, the Social and Economic Advisory Council, the Biological Diversity Advisory Council, state and federal government agencies and the public.

A total of **425** priority actions have been identified to help recover threatened species and tackle threatening processes in the Inverell Shire Council.

Level	Actions
High	172
Medium	174
Low	79
Total:	425

Table 14 - Overview of priority actions for the Inverell Shire for threatened species

Six frog species, six reptile species, thirty nine bird species and twenty six mammal species are presumed extinct in the Border Rivers - Gwydir CMA area. Fauna in the Inverell Shire are concentrated in timbered lands, with many of the species being located there holding a conservation status of vulnerable, protected and endangered. Fauna in regularly cultivated areas land tend to have a conservation status of vulnerable; however these species are less common in grasslands.

6.2.1 High Priority Actions

There are 172 priority actions identified as being 'High priority' in the Inverell Shire. These actions apply to 47 threatened species, populations and communities, and 1 key threatening process.

Scientific Name	Type of Species	Level of Threat	Priority Actions
<i>Acacia acrionastes</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Develop a monitoring program to assess the impact of recreational use, determine threats, long term population viability and response to management 2. Map known populations
<i>Acacia jucunda</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Identify three representative populations (per year over initial three years); focus research actions and adaptive management at these sites then apply knowledge to other populations. 2. Initiate population estimates at known sites to establish baseline data for monitoring and management programs. 3. Investigate seed viability; germination; dormancy and longevity (in natural environment and in storage).
<i>Acacia macnuttiana</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Consider <i>Acacia macnuttiana</i> during biodiversity certification of environmental planning instruments for Glen Innes and Tenterfield LGAs as it occurs on private land/council controlled land. 2. Determine if and/or where an ecological burn is required.
<i>Acacia petraea</i>	Trees	Endangered	<ol style="list-style-type: none"> 1. (Grazing Control) Fence off populations from grazing by goats; stock; and rabbits; allow for population growth in fenced areas; include these areas in ecological monitoring programs for the species. 2. As a priority; investigate suspicions that NSW populations have naturalised from plantings; and re-assess the conservation status in NSW. 3. Conduct baseline surveys to confirm known populations and locate new ones. 4. Ensure awareness of species location and identification for all personnel undertaking works on roads; road verges; road reserves and Travelling Stock Routes in potential habitat. 5. Ensure that Development Applications are carefully assessed to deter further clearing of potential habitat. 6. Investigate seed viability; germination; dormancy and longevity (in natural environment and in storage).

<i>Acacia pubifolia</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. <i>Acacia pubifolia</i> to be considered during biodiversity certification of environmental planning instruments for Tamworth; Uralla; Inverell; Glen Innes and Tenterfield LGAs as it occurs on private land/council controlled land. 2. Assess habitat condition and threats at known <i>Acacia pubifolia</i> sites. 3. Control the impacts of feral goats on <i>Acacia pubifolia</i>. 4. Determine the current population size and demography of <i>Acacia pubifolia</i>. 5. Encourage landholders with existing populations of <i>Acacia pubifolia</i> to manage populations appropriately. 6. Establish monitoring sites to determine trends in population size and demography. 7. Fence known populations on private land to exclude domestic stock. 8. Identify and avoid <i>Acacia pubifolia</i> populations where clearing or fragmentation of suitable dry shrubby woodland is proposed; via adequate surveys of areas. 9. Identify and avoid <i>Acacia pubifolia</i> populations where roadworks occur in areas of suitable dry shrubby woodland; via adequate surveys. 10. Map known populations of <i>Acacia pubifolia</i>. 11. Monitor threats at known <i>Acacia pubifolia</i> sites. 12. Regional fire plans and hazard reduction burn planning must consider the location of known <i>Acacia pubifolia</i> populations. Survey areas of suitable habitat in adjacent areas for further <i>Acacia pubifolia</i> populations.
<i>Adelotus brevis</i> - endangered population	Endangered Populations	Endangered Population	<ol style="list-style-type: none"> 1. Determine the presence of any populations within the range of the endangered population; and locations of the nearest populations to the boundary designation of the endangered population through surveys. 2. Monitor any located endangered populations; and populations closest to the designated boundary of the endangered population; to determine population changes and identify causes for these changes.
<i>Astrotricha roddii</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Conduct pre-logging surveys for <i>Astrotricha roddii</i> and establish exclusion zones prior to timber harvesting in Severn River State Forest and on private land supporting populations in the Inverell Shire. 2. Conduct systematic ongoing control of feral goats and pigs; particularly in the vicinity of Kings Plains National Park; Severn River Nature Reserve; the proposed Kwiambal National Park and Severn River State Forest. 3. If the EASTLINK project proceeds; known <i>Astrotricha roddii</i> sites in the vicinity of the proposed works should be protected. Any additional potential habitat under the proposed path of the power lines should be searched and any new sites protected.
<i>Boronia granitica</i>	Shrubs	Vulnerable	<ol style="list-style-type: none"> 1. Continue to monitor population viability every 2 years across selected sites (including seedling recruitment) and conduct Population Viability Analysis (PVA). 2. Undertake field studies to monitor seedling establishment and survivorship 3. Refine and implement an adaptive fire management strategy
<i>Cadellia pentastylis</i> (Ooline) community in the Nandewar and Brigalow Belt South IBRA Regions	Threatened Ecological Communities	Endangered Ecological Community	Identify at least 10 sites for implementation of recovery actions and monitoring. In particular; the Tenterfield Creek population needs to be investigated and its status assessed.
<i>Calyptorhynchus lathamii</i>	Birds	Vulnerable	Identify and map key breeding and foraging habitat; similar to the mapping done by Robinson (2004) at St Georges Basin.
<i>Chalinolobus nigrogriseus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure the largest hollow bearing trees are given highest priority for retention when undertaking Property Vegetation Plans (PVP) assessments (offsets should include remnants in old growth forest) or other land assessment tools. 2. Identify important foraging range and key habitat components for this species 3. Identify the effects of fragmentation on the species in a range of fragmented landscapes such as the farmland/forest interface and the urban/forest interface. For example movement and persistence across a range of fragment sizes 4. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups; species diversity; structural diversity. Give priority to largest hollow bearing trees

<i>Chalinolobus picatus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure the largest hollow bearing trees and standing dead trees (inc. small dead trees such as mulga; gidgee; leopardwood) are given highest priority for retention in PVP assessments or other land assessment tools. 2. Identify areas of private land that contain high densities of trees with hollows and dead standing trees as areas of high conservation value for planning and land management instruments. 3. Identify riparian vegetation in a wide strip bordering creeks and rivers on Western Slopes and Plains as areas of high conservation value in planning instruments and EIA development assessments. 4. Identify the effects of fragmentation on the species in a range of fragmented landscapes. (For example from cropping & cotton areas; grazing lands of high and low intensity to large remnants). 5. Prepare EIA guidelines which prioritise retention of hollow bearing trees and dead standing trees. inc. mulga; gidgee; leopardwood etc.) maintaining diversity of age groups; species 6. Promote the conservation of these private land areas with key habitat values using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means 7. Research the effect of different burning regimes. (For example in Mulga; Mallee and "invasive native scrub" associations) 8. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes
<i>Dasyurus maculatus</i>	Marsupials	Vulnerable	Habitat requirements of Spotted-tailed Quolls to be adequately conserved within environmental planning instruments and through other legislative protection mechanisms; including property vegetation plans.
<i>Dichanthium setosum</i>	Herbs and Forbs	Vulnerable	<ol style="list-style-type: none"> 1. Develop EIA guidance for consent and determining authorities with regard to development and other activities
<i>Digitaria porrecta</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Encourage livestock management so as to maintain or improve habitat for this species. 2. Negotiate with landholders (and neighbouring properties where relevant) to prepare and implement site management plans that address threats
<i>Ephippiorhynchus asiaticus</i>	Birds	Endangered	<ol style="list-style-type: none"> 1. Improve the protection of Black-necked Stork habitat by excluding stock; reducing grazing pressure and controlling weed species at important sites. Avoid placing powerlines over or near wetlands and/or nest sites. 2. Reduce nutrient runoff into wetlands known to be used by Black-necked Storks. Avoid the use of herbicides and pesticides near or in wetlands. 3. Restore natural hydrological regimes to freshwater wetlands. Maintain existing hydrological regimes. Do not fill or drain wetlands. Retain and protect native vegetation in and around wetlands. Restore degraded wetlands.
<i>Eucalyptus mckieana</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Control collection of firewood and retain all standing and fallen dead timber in stands containing the species. 2. Determine if and/or where an ecological burn is required. 3. Develop sustainable management guidelines and technical material to assist landowners. This will include measures to address stock management; ecological fire management and property maintenance activities. 4. Exclude stock from remnants containing the species to allow natural regeneration. 5. Maintain regular correspondence between the DECC and Forests NSW (DPI) to ensure the species is protected where it occurs in Forests NSW (DPI) estate. 6. Notify appropriate agencies of roadside and utility easement locations for protection during roadside and easement construction and maintenance activities. 7. Prepare identification and impact assessment guidelines and distribute to consent authorities. Provide for appropriate management in DECC Plans of Management and Fire Management Plans.
<i>Eucalyptus nicholii</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1 Determine if and/or where an ecological burn is required. 2 Identify roadside populations and protect during roadworks. 3 Liaise with private landowners over management of stands of <i>Eucalyptus nicholii</i>. 4 Manage grazing to enhance regeneration in known habitat. 5 Prevent further loss and fragmentation of known habitat of <i>Eucalyptus nicholii</i>.
<i>Eucalyptus rubida</i> subsp. <i>barbigerorum</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Assess threats at known sites. 2. Determine if and/or where an ecological burn is required. 3. Identify areas of known habitat for <i>Eucalyptus rubida</i> subsp <i>barbigerorum</i> suitable for incentive funding. 4. Identify roadside and easement populations of <i>Eucalyptus rubida</i>

			subsp <i>barbigerorum</i> and protect during roadworks.
<i>Fontainea australis</i>	Shrubs	Vulnerable	Identify information and resource needs to ensure that land managers and other stakeholders are aware of <i>Fontainea australis</i> populations and habitat and that its recovery requirements are taken into account in Plan of Managements (PoM's); fire plans and pest management plans. Map habitat and populations; assess habitat condition; estimate abundance and extent of populations. Survey habitat of the species prior to road and track maintenance. Assess need to protect trackside plants.
Howell Shrublands in the Northern Tablelands and Nandewar Bioregions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Ensure that the ecological community is considered in land use planning processes at all levels of government 2. Map the location and extent of the ecological community. Undertake a site assessment of remnants; and develop guidelines for mapping uses including discussion of its limitations. 3. Notify appropriate agencies of roadside and power easement locations for protection during roadside and easement construction and maintenance activities 4. Undertake strategic stock grazing or exclusion from the ecological community to allow natural regeneration. Any fencing must be accompanied by weed control. 5. Manage fire at an appropriate frequency for the regeneration and maintenance of the ecological community
<i>Ipomoea diamantinensis</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Collect seed for NSW Seedbank. Develop collection program in collaboration with Botanical Gardens Trust (BGT) - single provenance. 1. Conduct baseline surveys to locate new populations and extend the ranges of new populations and determine condition. Develop recovery actions from results e.g. regeneration needs, urgent threats. 2. Conduct experimental research into the effects of grazing and flooding disturbances 3. Erect fences around all known populations to protect them from stock trampling and grazing and pugging. 4. Identify and assess threats to the Goodooga Rd population and determine the most effective recovery strategy and monitoring program for the population. This will include liaison with the landholder(s). 5. Establish and implement a comprehensive monitoring program for all known populations following surveys. 6. Investigate seed viability; germination; dormancy and longevity (in natural environment and in storage). 7. Liaise with the landholder(s) of the properties on the "west side of the Narran River bridge on the S and N sides of Goodooga Rd" to implement the recovery actions for the population found at these sites in 2004. 8. Regularly monitor the Goodooga Road population to assess the success of the recovery actions being implemented. 9. Undertake field studies to monitor seedling establishment and survivorship.
<i>Lathamus discolor</i>	Birds	Endangered	<ol style="list-style-type: none"> 1. Coordinate volunteer surveys at known and potential Swift Parrot sites on private and public land. 2. Identify and map the extent and quality of Swift Parrot foraging and roosting habitat on private and public land (refer to species profile for regionally specific habitat information). 3. Protect; manage and restore Swift Parrot habitat on private land through conservation agreements; management agreements and incentive payments (refer to species profile for regionally specific habitat information).
<i>Lepidium monolocoides</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Clearly identify populations along utility access and ensure no impact through use or maintenance on these areas. 2. Develop management strategies that reduce disturbance of riparian areas. 3. Establish the extent of the population and identify core areas for protection. 4. Fence sites to prevent grazing (domestic stock; rabbits and kangaroos); slashing and soil compaction and pugging.
<i>Litoria booroolongensis</i>	Amphibians	Endangered	<ol style="list-style-type: none"> 1. Determine current distribution and abundance in relation to landscape and habitat quality attributes. 2. Prepare and implement an annual monitoring program to determine population status and the influence of management actions. 3. Use management agreements and incentives for riparian fencing and re-snagging to reduce further habitat degradation and enhance the extent of suitable habitat.

Loss and/or degradation of sites used for hill-topping by butterflies	Habitat loss/change	Key Threatening Process	<ol style="list-style-type: none"> 1. Conduct targeted surveys and identify priority sites used by hill-topping butterflies. 2. Restore and manage degraded habitat in key hill-topping areas. 3. Seek secure protection of key hill-topping sites. 4. Work with lepidopterist interest groups to undertake a community survey to identify butterfly hill-topping sites.
McKies Stringybark/Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Map the location and extent of the ecological community. Undertake a site assessment of remnants; and develop guidelines for mapping uses including discussion of its limitations. 2. Notify appropriate agencies of roadside and power easement locations for protection during roadside and easement construction and maintenance activities. 3. Undertake strategic stock grazing or exclusion from the ecological community to allow natural regeneration. Fencing must be accompanied by weed control. 4. Manage fire at an appropriate frequency and intensity for the regeneration and maintenance of the ecological community.
<i>Melanodryas cucullata cucullata</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Identify key habitats or areas on a regional basis for protection and enhanced management through incentives. 2. Implement sympathetic habitat management in conservation reserves; council reserves and crown reserves where the species occurs.
<i>Melithreptus gularis gularis</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Identify key habitats or areas on a regional basis for protection and enhanced management through incentives. 2. Implement sympathetic habitat management in conservation reserves; council reserves and crown reserves where the species occurs.
<i>Miniopterus schreibersii oceanensis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Monitor the breeding success of a representative sample of maternity colonies in cave roosts over a number of years to determine the viability of regional populations
<i>Mormopterus beccarii</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Identify areas of private land that contain high densities of hollow-bearing trees and dead standing trees as areas of High Conservation Value (HCV) in planning instruments and land management negotiations (e.g. LEP, CAPs, PVPs). 2. Promote the conservation of these high conservation value private land areas; using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means.
New England Peppermint (<i>Eucalyptus nova-anglica</i>) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Control rabbits, goats and pigs to allow natural regeneration of the ecological community. 2. Ensure that the ecological community is considered in land use planning processes at all levels of government. 3. Include a buffer between the ecological community and areas undergoing pasture improvement or cultivation. 4. Map the location and extent of the ecological community. As part of this; a site assessment of remnants will be undertaken and guidelines for the use of mapping and discussion of its limitations. 5. Notify appropriate agencies of roadside; rail and power easement locations for protection during roadside and easement construction and maintenance activities. 6. Retain all standing and fallen dead timber in the ecological community. Consider the use of nest boxes if required. 7. Undertake strategic stock grazing or exclusion from the ecological community to allow natural regeneration. Fencing must be accompanied by weed control.
<i>Ninox connivens</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Incorporate the consideration of Barking Owl habitat and potential habitat as a high priority in the assessment of property for reserve establishment. 2. Recovery Plan completed 2007
<i>Nyctophilus timoriensis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure the largest hollow bearing trees are given highest priority for retention in PVP assessments or other land assessment tools. 2. Identify vegetation in a wide strip bordering creeks and rivers on the Western Slope and Plains of NSW as high conservation value for this species. 3. Prepare EIA guidelines addressing key habitat requirements; including retention of adequate densities of hollow-bearing trees and undisturbed understorey vegetation. 4. Research the roosting ecology of this species. For example; to identify the attributes of key roosts. 5. Review current logging prescriptions. If insufficient; modify to ensure adequate retention of hollow-bearing trees; recruit trees and undisturbed foraging habitat.

<i>Phascolarctos cinereus</i>	Marsupials	Vulnerable	<ol style="list-style-type: none"> 1. Prepare and distribute Environmental Impact Assessment (EIA) guidelines for the koala to inform investigators; consent and determining authorities of the potential impacts to koalas from developments. 2. Survey the northern; central and southern tablelands of NSW to determine primary and secondary food tree species and assess the status of koala populations in these areas. 3. Recovery plan completed 2007 – exhibited draft.
<i>Poephila cincta cincta</i>	Birds	Endangered	Continue opportunistic data collection.
<i>Polygala linariifolia</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Develop EIA guidance for consent and determining authorities with regard to development and other activities. 2. Identify three targeted populations (per year over initial three years) and focus recovery actions there; applying adaptive management strategies to determine and ameliorate threats
<i>Pyrrholaemus sagittatus</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Identify key habitats or areas for protection and enhanced management through incentives.
<i>Rutidosis heterogama</i>	Herbs and Forbs	Vulnerable	<ol style="list-style-type: none"> 1. Avoid overgrazing of areas of known habitat. 2. Conduct research to determine ecological requirements; including fire ecology; and undertake field studies to monitor seedling establishment and survivorship. May involve autecological study or literature search for information on similar species. 3. Protect known habitat from frequent fire, and apply appropriate fire regime if needed once fire ecology is determined
<i>Saccolaimus flaviventris</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure the largest hollow bearing trees (including dead trees and paddock trees) are given highest priority for retention in PVP assessments and or other land assessment tools. 2. Identify areas of private land that contain high densities of large; hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP; CAPs; PVPs. 3. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups; species diversity; structural diversity. Give priority to largest hollow bearing trees. 4. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means.
<i>Scoteanax rueppellii</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure largest hollow bearing trees; inc. dead trees and paddock trees are given highest priority for retention in PVP assessments (offsets should include remnants in high productivity) and/or other land assessment tools. 2. Identify areas of private land that contain high densities of large; hollow-bearing trees as areas of high conservation value in planning instruments and land management negotiations e.g. LEP; CAPs; PVPs 3. Identify the effects of fragmentation on the species in a range of fragmented landscapes; such as cleared coastal river valleys. For example movement and persistence across a range of fragment sizes. 4. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups; species diversity; structural diversity. Give priority to largest hollow bearing trees. 5. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means.
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions	Threatened Ecological Communities	Endangered Ecological Community	Locate; map and prioritise sites in order to identify suitable sites for management and recovery actions.
<i>Stagonopleura guttata</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Identify key habitats or areas on a regional basis for protection and enhanced management through incentives. 2. Implement sympathetic habitat management in conservation reserves; council reserves and crown reserves where the species occurs.
<i>Syconycteris australis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Determine the effectiveness of PVP assessment; offsets and actions for bats. 2. Ensure a mosaic of nectar-producing trees and shrubs; esp. in coastal heath paperbark swamp as well as rainforest roost habitat. Give high priority in PVP assessments; or other assessment tools. 3. Identify critical foraging habitat in November when bats are breeding; but when few heath species are flowering.
<i>Thesium australe</i>	Herbs and Forbs	Vulnerable	<ul style="list-style-type: none"> • Consult with Aboriginal communities when undertaking actions on sites of cultural significance. • Determine if and/or where an ecological burn is required. • Encourage community participation in implementation of recovery actions for the species.

			<ul style="list-style-type: none"> • Implement control programs for rabbits and reduce impact of cattle through strategic grazing or exclusion. • Liaise with public agencies and private landowners over the implementation of management actions for the species. • Support funding for management work in habitat for the species and carry out habitat maintenance and protection at known locations for the species. • Undertake and support research into key aspects of the biology and ecology of Austral Toadflax that are likely to provide information that assists with management of the species. • Undertake annual monitoring of populations to provide information on the lifecycle of the species. • Undertake monitoring of populations to assess habitat quality; threats and ameliorative actions. • Recovery Plan completed 2007
<i>Tyto novaehollandiae</i>	Birds	Vulnerable	Prepare environmental impact assessment guidelines to assist consent and determining authorities and environmental consultants to assess impacts of developments on the Masked Owl.
<i>Underwoodisaurus sphyrurus</i>	Reptiles	Vulnerable	<ol style="list-style-type: none"> 1. Determine site specific management strategies to protect and enhance key populations. 2. Identify locations supporting key populations and prioritise site specific threats for ameliorative action. 3. Identify sites in key habitats and corridors for vegetation rehabilitation and undertake revegetation to provide links between key populations. 4. Provide fire wood in areas where recreational use overlaps with species habitat to preserve large fallen logs; leaf litter and groundcover vegetation. 5. Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s); risk register and/or operation map(s). 6. Reduce domestic stock and feral goat grazing pressure in areas where species is known to occur to maintain ground and litter cover. 7. Retain and protect areas of rocky dry open forest and woodland from clearing; fragmentation and disturbance. 8. Retain bushrock in its natural setting within the species habitat and obtain rocks for gardens only from licensed dealers. 9. Control and monitor feral and domestic ungulate disturbance in known and potential habitat. 10. Encourage the retention of dead fallen timber in areas where the species is known to occur.
<i>Zieria ingramii</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Conduct research to determine ecological requirements and undertake field studies to monitor seedling establishment and survivorship. 2. Identify at least 5 populations over the next 5 years for implementation of recovery actions/management. 3. Investigate seed viability; germination; dormancy and longevity (in natural environment and in storage). 4. Monitor the identified populations to determine the success or otherwise of recovery actions and to guide future actions. 5. Raise community awareness and support for the conservation of the species. 6. Recovery Plan coordination.

Table 15 - High priority actions for threatened species in the Inverell Shire

6.2.2 Medium Priority Actions

There are 174 priority actions identified as being 'Medium priority' in the Inverell Shire. These actions apply to 42 threatened species, populations and communities, and 1 key threatening process.

Scientific Name	Type of Species	Level of Threat	Priority Actions
<i>Acacia acrionastes</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Assess threats at the Pindari Dam site. 2. Determine where ecological burning is required. 3. Develop site plan for threat management at the Pindari Dam site and ensure on – ground works are carried out 4. Exclude domestic stock from areas containing <i>Acacia acrionastes</i> 5. Keep recreation areas at Pindari Dam separate from <i>Acacia acrionastes</i> and prevent further development from impacting the species
<i>Acacia jucunda</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Collect seed for NSW Seedbank (BRG). Investigate seed viability, germination, dormancy and longevity. 2. Conduct long term monitoring (including ecological responses to influencing processes; e.g. fire; insect attack; climate; competition; grazing) of known locations to determine changes in status of the species. 3. Control feral goats and rabbits (best practice: locally/regionally efficient and effective). 4. Opportunistically monitor populations after wildfire to determine fire ecology. 5. Identify three representative populations, focus research actions and adaptive management at these sites then apply knowledge to other populations.
<i>Acacia petraea</i>	Trees	Endangered	<ol style="list-style-type: none"> 1. Conduct experimental studies into fire ecology and impacts of grazing species disturbance. 2. Control feral goats and rabbits (best practice: locally/ regionally efficient and effective).
<i>Acacia pubifolia</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Determine if and/or where an ecological burn is required. 2. Develop and distribute environmental impact assessment guidelines for <i>Acacia pubifolia</i>.
<i>Adelotus brevis</i> - endangered population	Endangered Populations	Endangered Population	<ol style="list-style-type: none"> 1. Inform; educate & involve the community; landholders & stakeholders in the species recovery (incl. production/distribution of fact sheets on the species; threatening processes & recovery strategy; habitat management & protection; surveys & monitoring). 2. Minimise the spread of the disease chytridiomycosis to and between habitats.
<i>Boronia granitica</i>	Shrubs	Vulnerable	<ol style="list-style-type: none"> 1. Continue feral goat and pig control at Torrington SRA. 2. Investigate fire and disturbance ecology for <i>Boronia granitica</i>. 3. Undertake research into the life history attributes and reproduction for <i>Boronia granitica</i>. Undertake research to determine minimum fire frequency.
<i>Burhinus grallarius</i>	Birds	Endangered	Raise public awareness of the Bush Stone-curlew through publicity activities; such as public talks and publication of articles in popular magazines.
<i>Cadellia pentastylis</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Assist landholders in the control of feral goats in areas of habitat; particularly at the Tenterfield Creek population. 2. Ensure the Threatened Species Hazard Reduction List is updated with the requirements of this species and that personnel undertaking burns are aware of its presence and fire sensitivity. 3. Erect signage and fence off roadside remnants to protect from damage and disturbance from road works and traffic 4. Establish a comprehensive monitoring program to determine the success or otherwise of recovery actions and to guide future actions. 5. Fence off areas of habitat to protect from stock and feral animal grazing 6. Identify at least 3 sites for implementation of recovery actions and monitoring. In particular; the Tenterfield Creek population needs to be investigated and its status assessed. 7. Improve knowledge and understanding of the species' ecology by conducting research into population dynamics; genetic variation and establishment & recruitment of new individuals; focusing on whether inbreeding is adversely affecting populations. 8. Liaise with landholders regarding the possible acquisition of Turkey Ridge for the conservation of the species. 9. Re-initiate liaison with all landholders to discuss issues; management actions; fencing; etc. In particular; need to approach new landholders (on "Kelvin" and "Turkey Ridge") to encourage conservation of the species.

<i>Cadellia pentastylis</i> (Ooline) community in the Nandewar and Brigalow Belt South IBRA Regions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Assist landholders in the control of feral goats in areas of habitat; particularly at the Tenterfield Creek population. 2. Erect signage and fence off roadside remnants to protect from damage and disturbance from road works and traffic. 3. Fence off areas of habitat to protect from stock and feral animal grazing. 4. Re-initiate liaison with all landholders to discuss issues; management actions; fencing; etc. In particular; need to approach new landholders (on "Kelvin" and "Turkey Ridge") to encourage conservation of the species.
<i>Calyptrorhynchus lathamii</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Assist landholders who wish to enter into voluntary conservation agreements at key sites. 2. Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts. 3. Provide incentives for landholders to fence and manage key sites.
<i>Chalinolobus nigrogriseus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Ensure the Code of Practice for private native forestry includes adequate measures to protect large; hollow-bearing trees; viable numbers of recruit trees and provide protection for streamside vegetation. . 2. Identify areas of private land that contain key habitat (e.g. old growth forest dominated by Spotted Gum; box and ironbark) for the species as areas of high conservation value to use in planning instruments and land management negotiations. 3. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
<i>Chalinolobus picatus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Determine the effectiveness of PVP assessment; offsets and actions for bats. 2. Establish a community program to encourage the reporting of roosts. 3. Establish a program to encourage relocation rather than removal of power poles / old fence posts / shearing sheds and other infrastructure found to be used as roosts; when due for replacement. 4. Identify the importance of artificial water sources and potential impact of capping of bores/ bore drains and decommissioning of ground tanks & dams.
<i>Dasyurus maculatus</i>	Marsupials	Vulnerable	<ol style="list-style-type: none"> 1. At sections of roads where Spotted-tailed Quolls are frequently killed; incorporate methods to reduce the numbers of animals killed. Assess the effectiveness of different mitigation methods. 2. Conduct field and community surveys for the Spotted-tailed Quoll in areas where its distribution is poorly known. Areas identified for large-scale urban development (i.e. Far north coast; Hunter) and coastal reserves should be the highest priority. 3. Erect signs in areas where road kills are common to alert drivers to the presence of Spotted-tailed Quolls. 4. Identify sections of roads where Spotted-tailed Quolls are frequently killed on roads. Conduct a media campaign to ask for public records of road kills and use data held by the relevant government agencies.
<i>Dichanthium setosum</i>	Herbs and Forbs	Vulnerable	<ol style="list-style-type: none"> 1. Clearly identify roadside populations and ensure no impact by road maintenance. 1. Conduct media publicity campaign to highlight implementation of recovery actions. 2. Conduct weed control; especially of invasive exotic grasses. 3. Control rabbit grazing at selected sites (best practice: locally efficient and effective). 4. Discourage fertilizer drift into populations 5. Encourage livestock management so as to maintain or improve habitat for this species. 6. Ensure awareness of by managers and users of Travelling Stock Routes of the species' location and identification and requirements. 7. Develop fire strategies to protect populations. 8. Fence sites with high density populations to prevent grazing. 9. Negotiate with landholders (and neighbouring properties where relevant) to prepare and implement site management plans that address threats. 10. Opportunistically monitor populations after wildfire to determine fire ecology. 11. Research the ecology and habitat requirements of the species in NSW.
<i>Digitaria porrecta</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Clearly identify roadside populations and ensure no impact by road maintenance. 2. Conduct media publicity campaign to highlight implementation of recovery actions. 3. Conduct weed control; especially of invasive exotic grasses. 4. Control rabbit grazing near high density populations (best practice:

			<ol style="list-style-type: none"> locally efficient and effective). Develop EIA guidance for consent and determining authorities with regard to development and other activities. Discourage fertilizer drift into populations. Encourage landholders to enter VCAs and other site management agreements. Ensure awareness of by managers and users of Travelling Stock Routes of the species' location and identification and requirements. Ensure DECC is advised of any consents or approvals that affect the species. Fence sites with high density populations to prevent grazing. Monitor Queensland Recovery Plan and effort for guidance. Opportunistically monitor populations after wildfire to determine fire ecology Determine if and or where ecological burn is required.
<i>Eucalyptus caleyi</i> subsp. <i>ovendenii</i>	Trees	Vulnerable	<ol style="list-style-type: none"> Control feral animals in the range of the species
<i>Eucalyptus mckieana</i>	Trees	Vulnerable	<ol style="list-style-type: none"> Investigate the cultural significance of the species to local Aboriginal communities and opportunities for the community to be involved in management of the species. Liaise with landowners and promote community programs that assist with the conservation of the species. Restore and rehabilitate remnants and linkages in the landscape. Link this to other revegetation programs as well as recovery plans for threatened species and ecological communities. Undertake rabbit control in remnants to allow regeneration. Undertake weed control where required.
<i>Eucalyptus nicholii</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Control firewood collection in known <i>Eucalyptus nicholii</i> habitat.
<i>Eucalyptus rubida</i> subsp. <i>barbigerorum</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Liaise with landowners and Landcare groups over management of populations of <i>Eucalyptus rubida</i> subsp <i>barbigerorum</i>. Protect stands of <i>Eucalyptus rubida</i> subsp <i>barbigerorum</i> from firewood collection. Provide information to the public on <i>Eucalyptus rubida</i> subsp <i>barbigerorum</i>; particularly landowners adjacent to areas of known occurrence. Validate old database records and amend those that are spatially incorrect.
<i>Falsistrellus tasmaniensis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. Ensure the Code of Practice for private native forestry includes adequate measures to protect large; hollow-bearing trees and viable numbers of recruit trees. . Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments or other land assessment tools. Identify important foraging range and key habitat components for this species. Identify the effects of fragmentation in a range of fragmented landscapes e.g. cleared Tableland landscapes. For example genetic isolation; movement and persistence across a range of fragment sizes. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups; species diversity; structural diversity. Give priority to largest hollow bearing trees.
<i>Fontainea australis</i>	Shrubs	Vulnerable	<ol style="list-style-type: none"> Control weeds in populations shown to be affected by weed burden.
Howell Shrublands in the Northern Tablelands and Nandewar Bioregions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> Control rabbits, pigs and goats in and around the ecological community Undertake weed control where required.
<i>Ipomoea diamantinensis</i>	Herbs and Forbs	Endangered	Distribute information regarding the species; its threats and management actions to local landholders and interest groups to assist in locating and protecting the species.
<i>Lathamus discolor</i>	Birds	Endangered	<ol style="list-style-type: none"> Conduct Swift Parrot habitat research on both private and public land. Enhance habitat for Swift Parrots by planting suitable tree species to complement natural regeneration or to enhance remnants (refer to species profile for regionally specific habitat information). Reduce the incidence of Swift Parrot collisions by raising community awareness of the threat of man-made hazards (including windows/glass panes and high wire-mesh fences) in the vicinity of suitable habitat.

<i>Lepidium monoplacoides</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Collect seed for NSW Seedbank. Develop collection program in collaboration with BGT - multiple provenances. 2. Contribute conservation presentations to field days and community events particularly in agricultural regions where the species is known. 3. Determine if ex-situ conservation is required. 4. Discourage fertilizer and pesticide drift 5. Educate and encourage the community to protect and rehabilitate habitat. 6. Encourage conservation (through incentives) of the species and habitat in agricultural regions. 7. Encourage conservation restoration of natural wetland systems (including small wetlands and depression) in disturbed landscapes. 8. Encourage livestock management so as to maintain or improve habitat for this species. 9. Establish horticultural populations for breeding and reintroduction (multiple facilities) with the intention of establishing and supplementing populations. 10. Investigate options for the inclusion of extant populations in the Reserve system. 11. Investigate seed viability; germination; dormancy and longevity (in natural environment and in storage). 12. Monitor the response of the species to management actions; and identify any new or secondary threats at the site. 13. Negotiate with land managers (and neighbouring properties where relevant) to prepare and implement site management plans that address threats. 14. Research species habitat to assist in the location of areas that could support the plant and be suitable sites for reintroduction. 15. Research the ecology and habitat requirements of the species in NSW.
McKies Stringybark/Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Restore/rehabilitate remnants and linkages to the ecological community in the landscape. Link this to other revegetation programs and to recovery plans for threatened species and ecological communities. 2. Undertake weed control where required. 3. Retain all standing and fallen dead timber in the ecological community
<i>Miniopterus schreibersii oceanensis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Promote the conservation of these key roost areas using measures such as incentive funding to landholders; offsetting and biobanking; acquisition for reserve establishment or other means. 2. Control foxes and feral cats around roosting sites; particularly maternity caves and hibernation sites. 3. Determine the effectiveness of PVP assessment; offsets and actions for bats. 4. Ensure protection of known roosts and forest within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments. 5. Establish a gating design for disused mines across species range that will not adversely impact species. Consultation with cave bat specialist prior to any gating operations. 6. Promote bats throughout the rural community as ecologically interesting and important; but sensitive to disturbance at caves/disused mine tunnels.
<i>Mormopterus beccarii</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Determine the effectiveness of PVP assessment; offsets and actions for bats. 2. Educate to raise awareness of the effects of pesticides. 3. Ensure the Code of Practice for private native forestry includes adequate measures to protect large; hollow-bearing trees and viable numbers of recruit trees. 4. Establish a program to encourage relocation rather than removal of power poles / old fence posts / shearing sheds and other infrastructure found to be used as roosts; when due for replacement. 5. Identify the effects of fragmentation in a range of fragmented landscapes inc. the farmland/bush interface and the urban/bush interface e.g. movement and persistence across a range of fragment sizes.
<i>Myotis adversus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Encourage recovery of natural hydrological regimes; including retention and rehabilitation of riparian vegetation. . 2. Promote roosting habitat in new artificial structures within the species range.

New England Peppermint (<i>Eucalyptus nova-anglica</i>) Woodland on Basalts and Sediments in the New England Tableland Bioregion	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Involve landowners and promote community programs that assist with the conservation of the ecological community. 2. Restore/rehabilitate remnants and linkages to the ecological community in the landscape. Link this to other revegetation programs and to recovery plans for threatened species and ecological communities. 3. Undertake weed control where required.
<i>Ninox connivens</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Develop and distribute the Barking Owl information package. This will contain the species profile; environment assessment guidelines and prescriptions to minimise potential impacts. 2. Negotiate with individual land managers to achieve appropriate measures to protect all known Barking Owl nest sites in NSW. Protection will need to address threats such as human disturbance; collision with wires; secondary poisoning from chemicals. 3. Prepare a poster and undertake a community survey and media campaign in rural and regional NSW to raise community awareness of the Barking Owl. The importance of each individual owl; and particularly breeding sites will be stressed.
<i>Nyctophilus timoriensis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Develop and promote a State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. 2. Identify areas of private land containing high densities of large; hollow-bearing trees (i.e. near to natural densities) as areas of high conservation value for this species. 3. Identify large remnants (i.e. > 100 ha) on private property as high conservation value for this species. 4. Maintain or improve the value of identified HCAs using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other relevant options. 5. Study the biology; ecology and habitat requirements of the species in different western environments; such as Mallee and ironbark-cypress forest. 6. Undertake long-term monitoring of populations across tenures.
<i>Polygala linariifolia</i>	Herbs and Forbs	Endangered	<ol style="list-style-type: none"> 1. Conduct weed control at 5 selected sites and monitor benefit. 2. Educate and encourage the community to protect and rehabilitate habitat. 3. Encourage landholders to manage livestock grazing so as to maintain or improve habitat for this species. 4. Ensure awareness of species location and identification for all personnel undertaking maintenance of road verges; trails; powerlines and water fixtures.
<i>Pomaderris queenslandica</i>	Shrubs	Endangered	<p>Consider populations of <i>Pomaderris queenslandica</i> on road reserves; other council controlled land and crown land during environmental and operational planning as well as during biodiversity certification of environmental planning instruments for LGAs.</p> <p>Liaise with landowners and Landcare groups over management of <i>Pomaderris queenslandica</i>.</p> <p>Manage weeds at known populations.</p>
Predation by the Plague Minnow (<i>Gambusia holbrooki</i>)	Pest animal	Key Threatening Process	Prepare environment assessment advice for Local Government regarding activities that may result in human induced dispersal of <i>Gambusia</i> .
<i>Rutidosia heterogama</i>	Herbs and Forbs	Vulnerable	<ol style="list-style-type: none"> 1. Assess threats and prepare site plans for larger populations and for populations over a range of the distribution. 2. Liaise with Landcare groups; landowners and managers to increase understanding of strategies to protect <i>Rutidosia heterogama</i> habitat. 3. Survey potential habitat in areas adjacent to known populations for additional populations.
<i>Saccolaimus flaviventris</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. 2. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
<i>Scoteanax rueppellii</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc.
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Encourage landholders to cease grazing and/or thinning in areas of habitat. 2. Liaise with landholders to encourage conservation of remnant patches of Endangered Ecological Communities on their land.
<i>Syconycteris australis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Determine the extent of use of revegetation in development areas that are subject to high ambient light levels 2. Identify areas of private land that contain patches (including small) of littoral rainforest as areas of HCV in planning instruments and land management tools (e.g. LEP; Catchment Action Plans; PVPs). 3. Initiate and support rainforest and heath regeneration projects where coastal habitat has been cleared and fragmented.

			<ol style="list-style-type: none"> 4. Prepare EIA guidelines which address the retention of a mosaic of nectar-producing trees and rainforest roost habitat 5. Promote the conservation of these areas using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means.
<i>Thesium australe</i>	Herbs and Forbs	Vulnerable	Implement Bitou bush control as described in the approved TAP.
<i>Tyto novaehollandiae</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Develop a sampling methodology stratified across different land tenures and disturbance histories; as well as a set of standardised regional monitoring protocols. 2. Encourage CMAs to invest in actions that actively manage and/or conserve large forest owl habitat as part of their Catchment Action Plans. 3. Encourage private landholders to undertake management options to conserve and/or actively manage forest owl habitat. 4. Estimate amount of mapped modeled habitat for Masked Owls that is occupied (based on proportion of sample sites with owls in them). Use this to further estimate number of owl territories within different land tenures (based on home range data). 5. Implement a regional monitoring program. This will be undertaken once owl habitat models have been refined; validated and sampling strategy developed. 6. Investigate and pursue the cooperative involvement of other agencies; researchers and the community in the implementation of the regional monitoring program. 7. Investigate the implementation of the forestry threatened species licence owl prescriptions by carrying out proactive audits targeting these prescriptions and through Integrated Forest Operations Approval (IFOA) monitoring and reporting. 8. Monitor and report on effectiveness of concurrence and licence conditions previously applied to reduce impacts of development on Masked Owls and their habitats; by recording conditions; picking case studies and checking owl presence post development. 9. Provide up to date and accurate large forest owl and habitat information in the PVP Developer - Threatened Species Tool'. 10. Use records of concurrence and licence conditions to develop a set of prescriptive guidelines that may be used to mitigate the impacts of developments on the Masked Owl outside conservation reserves and State forests.
<i>Underwoodisaurus sphyrurus</i>	Reptiles	Vulnerable	<ol style="list-style-type: none"> 1. Control feral cat; pig and fox populations in areas where key populations of the species are known to occur. 2. Logging waste in forest or woodland should not be stock-piled or burnt where the species occurs.

Table 16 - Medium priority actions for threatened species in the Inverell Shire

6.2.3 Low Priority Actions

There are 79 priority actions identified as being 'Low priority' in the Inverell Shire. These actions apply to 32 threatened species, populations and communities, and 1 key threatening process.

Scientific Name	Type of Species	Level of Threat	Priority Actions
<i>Acacia acrionastes</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Collect seeds for NSW Seedbank (BRG). Investigate seed viability, germination, dormancy and longevity. 2. Implement statutory land reservation at known locations near Pindari Dam. 3. Maintain populations ex situ at suitable botanic gardens; regional gardens or nurseries 4. Provide interpretative information Pindari dam. 5. Survey areas of potential habitat in the Pindari Dam area and western Border ranges for additional populations.
<i>Acacia jucunda</i>	Shrubs	Endangered	<ol style="list-style-type: none"> 1. Develop educational material to encourage the community to protect and rehabilitate habitat.
<i>Acacia petraea</i>	Trees	Endangered	<ol style="list-style-type: none"> 1. Conduct long term monitoring (including ecological responses to influencing processes - e.g. fire; insect attack; climate; competition; grazing) of known locations to determine changes in status of the species. 2. Opportunistically monitor populations after wildfire to determine fire ecology. 3. Develop educational material to encourage the community to protect and rehabilitate habitat
<i>Acacia pubifolia</i>	Shrubs	Endangered	Involve local Land Care groups (if existing) in the management of <i>Acacia pubifolia</i> .
<i>Adelotus brevis</i> - endangered population	Endangered Populations	Endangered Population	<ol style="list-style-type: none"> 1. Control and; where practicable; eradicate introduced fish from habitat. 2. Minimise further degradation and removal of habitat; particularly from timber harvesting; removal of dead timber; cattle grazing and inappropriate fire regimes.
<i>Boronia granitica</i>	Shrubs	Vulnerable	<ol style="list-style-type: none"> 1. Conduct further surveys of suitable habitat to confirm the presence of other populations. 2. Investigate recruitment cues for <i>Boronia granitica</i>.
<i>Burhinus grallarius</i>	Birds	Endangered	<ol style="list-style-type: none"> 1. Support and encourage the management of Bush Stone-curlew habitat on private land; as per the habitat management guidelines in the recovery plan. 2. Using NSW Wildlife Atlas records as a guide; undertake community and field surveys for Bush Stone-curlews and manage their habitat on public land as per survey and habitat management guidelines in the recovery plan; wherever possible.
<i>Cadellia pentastylis</i>	Trees	Vulnerable	<ol style="list-style-type: none"> 1. Attempt to enter into Vacs with landholders where the species occurs on private property e.g. Turkey Ridge. 2. Provide advice and assistance for the removal of weed species within Ooline habitat such as Tiger Pear.
<i>Cadellia pentastylis</i> (Ooline) community in the Nandewar and Brigalow Belt South IBRA Regions	Threatened Ecological Communities	Endangered Ecological Community	<ol style="list-style-type: none"> 1. Attempt to enter into Vacs with landholders where the species occurs on private property e.g. Turkey Ridge. 2. Provide advice and assistance for the removal of weed species within Ooline habitat such as Tiger Pear.
<i>Calyptorhynchus lathamii</i>	Birds	Vulnerable	Continue existing monitoring programs (e.g. Goonoo population) and encourage other community groups to develop a monitoring program of local populations.
<i>Chalinolobus nigrogriseus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Develop and promote bat awareness programs for schools; CMAs; landholders and industry groups etc. 2. Long term monitoring of populations cross tenure in conjunction with other forest bat species to document changes. 3. Promote the conservation of private land areas with key habitat using measures such as incentive funding to landholders, off-setting and bio-banking, acquisition for reserve establishment or other means.
<i>Chalinolobus picatus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. 2. Ensure the Code of Practice for private native forestry includes adequate measures to protect large; hollow-bearing trees and viable numbers of recruit trees.

<i>Climacteris picumnus victoriae</i>	Bird	Vulnerable	3. Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs
<i>Dasyurus maculatus</i>	Marsupials	Vulnerable	1. Collect genetic samples from all Spotted-tailed Quoll populations during field surveys and regular monitoring activities. 2. Consult with Aboriginal land managers regarding intended conservation management efforts for Spotted-tailed Quolls on lands of interest to them.
<i>Eucalyptus rubida</i> subsp. <i>barbigerorum</i>	Trees	Vulnerable	1. Map extent of known populations. 2. Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage)
<i>Falsistrellus tasmaniensis</i>	Bats	Vulnerable	1. Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value (HCV) planning instruments and land management negotiations e.g. LEP; CAPs; PVPs. 2. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders; off-setting and biobanking; acquisition for reserve establishment or other means. 3. Quantify any benefits to local bat populations from reducing the impact of insect pests on commercial crops. 4. Undertake long term monitoring of populations cross tenure in conjunction with other bat species to document changes.
<i>Fontainea australis</i>	Shrubs	Vulnerable	Encourage the community to participate in the detection of <i>Fontainea australis</i> at new locations; and encourage their participation in habitat rehabilitation projects.
<i>Goodenia macbarronii</i>	Herbs and Forbs	Vulnerable	1. Determine the full range and status of the species. 2. Encourage land holders to retain or reintroduce water flows to sites where the species occurs to prevent desiccation of habitat 3. Understand the species response to disturbance regimes by conducting experimental research into the effects of fire, flooding, road grading, vehicle disturbance, grazing and trampling by stock in order to guide recovery actions.
Howell Shrublands in the Northern Tablelands and Nandewar Bioregions	Threatened Ecological Community	Endangered Ecological Community	1. Involve land owners and promote community programs that assist with the conservation of the ecological community 2. Restore and or rehabilitate remnants and linkages to the ecological community in the landscape. Link this to other revegetation programs and to recovery plans for threatened species and ecological communities
Loss and/or degradation of sites used for hill-topping by butterflies	Habitat loss/change	Key Threatening Process	Erect interpretive signage at key hill-topping sites.
McKie's Stringybark/Blackbutt Open Forest in the Nandewar and New England Tableland Bioregions	Threatened Ecological Community	Endangered Ecological Community	1. Control feral animals within the vicinity of the population
<i>Miniopterus schreibersii oceanensis</i>	Bats	Vulnerable	1. Exclude prescription burns from 100 metres from cave entrance, ensure smoke and flames of fires do not enter caves or roosts in artificial structures. 2. For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays. 3. Identify and protect significant roost habitat in artificial structures (e.g. culverts, old buildings and derelict mines). 4. Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts. 5. Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies. 6. Restrict access where possible to known maternity sites (e.g. signs; bat friendly, preferably external gates at caves) 7. Restrict caving activities at significant roosts during important stages of the annual bat life cycle (e.g. winter hibernation, summer maternity season) 8. Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts. 9. Undertake non – chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.
<i>Mormopterus beccarii</i>	Bats	Vulnerable	1. Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. 2. Establish a community program to encourage the reporting of roosts. 3. Investigate the effectiveness of logging prescriptions. 4. Quantify any benefits of local bat populations to reducing the

			<ol style="list-style-type: none"> 5. impact of insect pests on commercial crops. 6. Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes; such as revegetating and installing bat boxes. 7. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. 7. Undertake a targeted survey to determine distribution and status in NSW, particularly North Coast and the North Western Plains.
<i>Myotis adversus</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Better regulate pollution of waterways e.g. sewage and fertilizer run-off (eutrophication) and pesticide/herbicide leakage (chemical pollution) and thermal pollution. 2. Ensure the largest hollow bearing trees in riparian zones are given highest priority for retention in PVP assessments or other land clearing assessment tools. 3. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups; species diversity; structural diversity. Give priority to largest hollow bearing trees. 4. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. 5. Identify, protect and enhance roost habitat beneath artificial structures (e.g. bridges), especially when due for replacement, and assess effectiveness of the actions.
<i>Ninox connivens</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Establish a program to monitor the NSW Barking Owl population and study its demographics, including the development, trial and establishment of a protocol for high quality surveys to monitor the Barking Owl across land tenures and habitat types in NSW 2. Establish formal conservation arrangements for properties with Barking Owls, which can be used to protect wildlife habitat.
<i>Poephila cincta cincta</i>	Birds	Endangered	<ol style="list-style-type: none"> 1. Develop reintroduction proposal. 2. Identify potential sites for reintroduction.
<i>Pomatostomus temporalis temporalis</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
<i>Pyrrholaemus sagittatus</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
<i>Saccolaimus flaviventris</i>	Bats	Vulnerable	Identify the effects of fragmentation on the species in a range of fragmented landscapes.
<i>Scoteanax rueppellii</i>	Bats	Vulnerable	<ol style="list-style-type: none"> 1. Raise awareness of the effects of pesticides. 2. Undertake long term monitoring of populations cross tenure in conjunction with other bat species to document changes.
<i>Syconycteris australis</i>	Bats	Vulnerable	<ol style="list-style-type: none"> (b) Develop and promote State-wide bat awareness programs for schools; CMAs; landholders and industry groups etc. (c) Control coastal weed species e.g. Bitou Bush, but avoid aerial spraying during the flowering season of important heath species as herbicides can directly collect in flowers that are fed upon at night. (d) Develop burning strategies that reduce impacts on preferred habitat in known foraging areas. (e) Undertake long term monitoring of select populations cross tenure.
<i>Tyto novaehollandiae</i>	Birds	Vulnerable	<ol style="list-style-type: none"> 1. Prepare guidelines addressing issues associated with habitat protection and management and survey and assessment on private lands.
<i>Underwoodisaurus sphyrurus</i>	Reptiles	Vulnerable	<ol style="list-style-type: none"> 1. Control and monitor weed invasion within known and potential habitat.

Table 17 - Low priority actions for threatened species in the Inverell Shire

These priority actions can be grouped into 23 recovery strategies and 4 threat abatement strategies.

6.2.4 Recovery strategies

Of the 425 priority actions in this region, 419 are focused mainly on the recovery of threatened species, populations and ecological communities. These priority actions are grouped into **23** recovery strategies, which are listed below.

Aboriginal liaison and/or interpretation

Aboriginal communities have a strong association with many threatened species through their use of medicinal plants and bush tucker, as well as through kinship and spiritual relationships. These associations may vary in significance between the many communities in NSW. Helping threatened species recover will involve liaising with Aboriginal elders and their communities to incorporate their knowledge and experience, and ensuring they are informed about proposed recovery actions. When Aboriginal people have cultural responsibilities or kinship obligations to protect a species, these people should be involved in determining recovery plans.

Aboriginal people's involvement in threatened species recovery enables them to fulfil cultural obligations to care for country, maintain cultural traditions and practices and contribute to the wellbeing of their community. DECC has prepared guidelines to facilitate Aboriginal community involvement in threatened species recovery planning (English and Baker, 2003).

Consultation with Aboriginal communities is a statutory requirement for the preparation of recovery plans and has been a part of many already approved plans. Aboriginal people will also be consulted to help recover other species that a recovery plan will not be prepared for where there is a known cultural association, e.g. the Green Turtle (*Chelonia mydas*). It is expected that the list of threatened species requiring Aboriginal liaison and interpretation as part of the recovery strategy will increase once partnerships with Aboriginal communities become better established.

Assess threats and determine recovery strategies

For many animals and plants there is often a lack of information about the nature and severity of the threats affecting them. An initial recovery strategy therefore is to identify and assess the threats and determine what recovery actions need to be implemented.

Captive Husbandry or ex-situ collection/propagation

Captive husbandry is the breeding of animals in a controlled environment to build up numbers when they have significantly declined in the wild, or where threats are so severe that the species is no longer able to survive in the wild. It involves the collection of animals from the wild, the establishment and maintenance of appropriate facilities and the development of a breeding program that may incorporate genetic management.

Ex-situ collection and propagation is the collection, establishment, maintenance and growth of plant material including seeds in conditions other than the wild. It is a useful strategy to protect against the loss of genetic material that may result from unexpected local extinctions.

Both captive husbandry and ex-situ collection and propagation are often precursor actions to translocation and reintroduction.

Community and land-holder liaison/ awareness and/or education

Threatened animals and plants occur across NSW and their continued survival in the wild is a collective partnership involving all land managers. Community support and involvement is crucial to the continued success of recovery programs, particularly for those species whose distribution predominantly occurs on private land.

Engaging community interest and participation ensures that important aspects of the ecology of species and threats facing them are understood, and provides opportunities to become involved with species recovery locally. Community liaison, awareness and education includes on-site meetings and open days, and preparing and distributing species profiles, school resource kits, posters, fact sheets and other promotional materials.

Coordinate the recovery and/or threat abatement program

Recovery or threat abatement teams are useful when recovery involves several stakeholders and land managers. Team coordinators will coordinate actions and liaise with stakeholders such as other government agencies, community members and scientists. Coordination enables PAS actions to be implemented in an efficient and cost-effective manner, particularly for species that have numerous and complex actions.

Data recording and storage

The development and maintenance of systems that record the location of species or key components of their habitat is an essential part of threatened species management. Information gathered from survey, monitoring and mapping actions will often need to be verified or incorporated into databases such as the NSW Atlas of Wildlife. Managers can use this information to implement on ground site protection and restoration programs.

Develop and implement protocols and guidelines

Protocols and guidelines provide advice on how to best manage a species and enables recovery to be facilitated in an efficient, cost effective and consistent manner. This strategy is broad in scope and includes such things as best practice guidelines, site management plans, codes of practice and can relate to policy and procedures for managers who have threatened species on their land.

Disease and pathogens

Introduced microbes such as bacteria, viruses and fungi can seriously impact on the health of native plants and animal populations. They can be introduced into the environment through the illegal importation and release of introduced animals and plants or transport of contaminated soil and other raw materials. The containment and elimination of these threats will rely on the development, implementation and enforcement of adequate quarantine and site hygiene protocols.

Habitat management

The PAS recommends various strategies to manage the habitat of threatened species. These include both planning and on ground works to control weeds, pest animals, fire and other human related threats.

- Feral Control

Feral animals such as rabbits, pigs, goats, wild dogs, cats, and the fox, pose a major threat to many threatened species. They compete for food and nest or roost sites; prey on adults, juveniles and eggs; and damage and degrade natural habitats and breeding sites. The impacts of some of these species are recognised as Key Threatening Processes (KTP). The control of feral animals through targeted culling programs and exclusion at priority sites is therefore an important strategy for threatened species.

- Fire

Native animals and plants respond differently to fire. Some can persist under a range of fire regimes. However, in many cases, too frequent fire may harm species by killing them, preventing them from spreading, depleting the soil seed bank, or modifying their habitat. Planning for threatened species recovery in relation to fire may mean implementing variable fire regimes and excluding those that are detrimental. Fire management may involve managing hazard reduction activities such as slashing and mowing, to prevent these activities from impacting on species and their habitats.

- Grazing

Overgrazing by introduced animals such as goats, rabbits and domestic stock can severely damage habitat by modifying and removing vegetation, compacting the soil, trampling and fouling waterholes and spreading weeds. This can lead to an overall decline in species diversity and resilience of the ecosystem as a whole. Grazing pressure is also often associated with inappropriate fire regimes. In some cases impacts from grazing may also be caused by native animals. Reducing the impacts of grazing involves excluding stock from key sites, managing access to waterholes and applying other strategic grazing practices.

- Ongoing EIA - Advice to consent and planning authorities

Advising on the implications and impacts of proposed development activities on threatened species and their habitats is an ongoing recovery action. DECC advises authorities responsible for regional and local planning and development approvals. DECC also informs and advises consultants and other investigators who assess the potential impacts of developments or activities, leading to better conservation outcomes for threatened species. Advice includes environmental impact assessment guidelines, survey guidelines and species profiles, or ongoing liaison and consultation on statutory obligations.

- Other

Habitat management includes other actions that are not currently part of a PAS strategy. These include developing best practice guidelines or standards for habitat management, pursuing incentive schemes and stewardship programs, preparing site management plans or managing issues such as erosion, subsidence or flooding. Over time DECC will develop a broader range of strategies to incorporate these habitat management initiatives.

- Site Protection (e.g. Fencing/Signage)

Habitats for threatened species often require protection from disturbances such as vehicles, over visitation, livestock and native animal grazing, and roadside maintenance or feral animals. Site protection may involve restricting access to a site by installing fencing or bollards, or placing signs or markers along roads, tracks and utility easements. Aboriginal communities should be involved in decision making when site protection involves restricting access. It may be necessary to discuss balancing protecting threatened species with cultural issues.

- Water

The maintenance of river flow regimes and water quality are fundamental to good river health. Ecological processes which sustain native fish and frog populations, vegetation, wetlands and birdlife depend on it. Programs need to be developed that control inappropriate water flows and urban runoff which can result in increased erosion and sedimentation and reductions in water quality.

- Weed Control

Weeds compete with native plants for resources such as light and nutrients, and can aggressively invade areas, displacing native plants and animals. The impacts of a number of weed species such as Bitou Bush (*Chrysanthemoides monilifera*) are identified as KTP. The control of weeds at priority sites can help recover threatened species.

Habitat Protection (critical habitat nomination etc)

Habitat protection enables conservation of an area that a threatened species occupies or primarily relies on. Protection may be required where habitat is poorly represented in reserves or pressured by development or other land clearing or modifying activities. Several legislative mechanisms protect habitat. They include the listing of 'Critical Habitat', where DECC identifies habitat that is crucial to the survival of an endangered or critically endangered species, population or ecological community. Other mechanisms include voluntary conservation agreements between private landowners and DECC and joint management agreements between public authorities and DECC to permanently protect threatened species' habitat. An additional mechanism may be the acquisition of land to form part of a national park.

Habitat Rehabilitation/Restoration and/or Regeneration

Habitat loss or modification for urban development and agricultural practices has been a major factor in the decline of many native plants and animals. Rehabilitation and regeneration of lost or modified habitat can help many threatened species continue to survive in the wild. Actions include planting local native plants to provide food, shelter and roosting sites, or bush regeneration to reduce the impact on native plants from weeds. Many local community groups are enhancing and restoring the natural environment and assisting in the continued survival and increase in numbers of native species.

Monitoring

It is important to monitor key characteristics of a species or its habitat to ensure management actions are meeting their objectives for recovery. For example, managers may monitor:

3. Changes to species abundance, for an assessment of population health
4. Predator numbers, to indicate the effectiveness of pest control programs
5. Water quality or vegetation understorey cover, to assess the condition of a species' preferred habitat.

Aboriginal people may wish to be involved in monitoring species or their habitats they hold kinship associations for. Involvement in monitoring enables Aboriginal people to actively care for the wellbeing of species of cultural importance.

Prepare Threat Abatement Plans

For some species the major factor limiting their recovery is the ongoing impact of certain KTP. This may particularly be the case for pest species that prey on threatened species, degrade their habitat or compete with them for preferred habitat or food. The preparation and implementation of a threat abatement plan (TAP) to ameliorate the impacts of a particular KTP may be the most effective and efficient first step in recovering a threatened species. Another advantage of a TAP is that the recommended actions can benefit more than one species. This strategy is also a threat abatement strategy.

Recovery Plan Preparation

A formal recovery plan will be required for threatened species that are iconic, or have complex conservation issues involving a suite of management actions or require the input and agreement of multiple stakeholders including Aboriginal communities. Under the *Threatened Species Conservation Act 1995*, recovery plans may be prepared for a single or group of threatened species, or for part of the range of a species. DECC may also be contracted by the Commonwealth Government to prepare recovery plans for species listed as threatened under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act 1999).

Multi species

These are most effective for two or more species or ecological communities of the same taxonomic group or geographic region that share a common threat or threats.

Regional range recovery plan

A regional range recovery plan is suitable for broadly distributed species, where the threatening processes vary in type and severity across their range.

Single species

Single species recovery plans are most appropriate for species that have specific habitat requirements and threats.

Research

Research is needed to further our knowledge and understanding of threatened species and the factors influencing their survival to enhance their future management. PAS research actions are directed toward the following areas:

6. General biological and ecological studies to help increase knowledge of a species' biology, ecology, habitat requirements or behaviour patterns. For example, research into a plant species' response to fire can help managers apply appropriate fire regimes, or understanding the reproductive requirements of a species enables threats to be abated so populations remain viable.
7. Research into causes of decline to clarify understanding of the threats and consequences of threats impacting on species and to inform managers of solutions requiring implementation. For example, investigating the susceptibility of certain threatened plant species to pathogens such as *Phytophthora* will result in the implementation of hygiene control measures or restricted site access.
8. Research into solutions to increase knowledge of how to design strategies to recover a species. Strategies may include research into predator or disease control, methods for restoring degraded ecological communities, or developing captive breeding or *ex-situ* propagation techniques.

Survey/Mapping and Habitat assessment

Surveys are useful in:

9. Updating or confirming information about the distribution of a threatened species, by increasing knowledge of where a threatened species is located and the habitats and land tenures it occupies.
10. Clarifying understanding of the conservation status of a threatened species and the threats that may be operating at a site.

Surveys may benefit from the involvement of Aboriginal people to ensure that relevant cultural knowledge on species distribution is considered with the results of scientific assessments. Mapping and habitat assessment enables a clearer interpretation of the locations or distribution of threatened species and their habitats. It also incorporates habitat analysis and modeling of predictive distributions, allowing biologists to more effectively target surveys and predict where habitats may be situated and where recovery actions may be directed. This information helps environmental managers to assess the significance and impacts of proposed developments or activities.

Translocation and/or reintroduction

Translocation is the deliberate movement of individuals, or regenerative plant material, to either supplement a wild population, reintroduce a species to an area where it has previously become locally extinct, or in extreme situations introduce a species to a location outside its former range. As a fundamental aim of species recovery is to conserve plants and animals in the wild, translocation is generally only undertaken where it is necessary to ensure the continued survival of the species and may be utilised in situations where a population is in danger of becoming locally extinct. Translocations should always be undertaken in accordance with relevant translocation policies.

Utilisation (direct take)

The illegal harvesting of plants, capture of native animals and collection of key habitat attributes such as bushrock can dramatically reduce the abundance of local populations. Direct loss of individual animals, particularly aquatic reptiles and marine mammals through entrapment in fishing nets or as by-catch can cause severe impacts. Reducing the impacts of 'direct take' will involve a variety of actions ranging from deterrence, community education and improvements to industry methods.

Other Action

Not all recovery actions fall neatly under the recovery strategies in the PAS. Actions in the 'other action' category include disease control programmes, development of record keeping systems and ongoing data management, policy development and review, site assessment and by-catch control. Over time, DECC will develop a more comprehensive list of recovery strategies that better accommodate the full range of proposed actions.

6.2.5 Threat abatement strategies

Of the 425 priority actions in this region, 6 are focused mainly on the abatement of threatening processes. These priority actions are grouped into **4** threat abatement strategies, which are listed below:

- 1) Establish management agreements with public authorities, CMAs and land managers/owners
- 2) Habitat management & Site Protection (e.g. Fencing/Signage)

The PAS recommends various strategies to manage the habitat of threatened species. These include both planning and on ground works to control weeds, pest animals, fire and other human related threats.

Habitats for threatened species often require protection from disturbances such as vehicles, over visitation, livestock and native animal grazing, roadside maintenance or feral animals. Site protection may involve restricting access to a site by installing fencing or bollards, or placing signs or markers along roads, tracks and utility easements. Aboriginal communities should be involved in decision making when site protection involves restricting access. It may be necessary to discuss balancing protecting threatened species with cultural issues.

- 3) Habitat Rehabilitation/Restoration and/or Regeneration

Habitat loss or modification for urban development and agricultural practices has been a major factor in the decline of many native plants and animals. Rehabilitation and regeneration of lost or modified habitat can help many threatened species continue to survive in the wild. Actions include planting local native plants to provide food, shelter and roosting sites, or bush regeneration to reduce the impact on native plants from weeds. Many local community groups are enhancing and restoring the natural environment and assisting in the continued survival and increase of native species.

4) Survey/Mapping and Habitat Assessment

Surveys are useful in:

11. Updating or confirming information about the distribution of a threatened species, by increasing knowledge of where a threatened species is located and the habitats and land tenures it occupies.
12. Clarifying understanding of the conservation status of a threatened species and the threats that may be operating at a site.

Surveys may benefit from the involvement of Aboriginal people to ensure that relevant cultural knowledge on species distribution is considered with the results of scientific assessments. Mapping and habitat assessment enables a clearer interpretation of the locations or distribution of threatened species and their habitats. It also incorporates habitat analysis and modeling of predictive distributions, allowing biologists to more effectively target surveys and predict where habitats may be situated and where recovery actions may be directed. This information helps environmental managers to assess the significance and impacts of proposed developments or activities.

6.2.6 Distribution of threatened species, populations and ecological communities

Name of Corridor	Areas Linked by Corridor
Kings Plains - Severn River	Links-Severn River NP to-King Plains NP
Severn River	Links-Severn River NP to-Taronga Corridor
Kings Plain	Links-Kings Plains NP to-Stony Creek Corridor
Single NP - Mt Topper	Links-Single NP to-Lowes Creek
Sutherlands	Links-Slurry Gully to-Moore Creek
Ventura	Links-Copes Creek to-Sandy Creek

Table 18 - Regional corridors in North East NSW

Note: This data has been derived from *Key Habitats and Corridors (KHC) for Forest Fauna: A Landscape Framework for Conservation in North-East New South Wales*. Occasional Paper 32 National Parks and Wildlife Service.

The Key Habitat and Corridors Project applies fauna data across landscapes through the use of modeled distributions of priority forest fauna species. Thus key habitats and linking corridors for priority faunal assemblages are delineated across north-east NSW. Fauna assemblages are groups of species of priority forest fauna displaying similar modeled habitat distributions; assemblages are a practical level at which to conduct conservation planning and management.

Mapped key habitats are areas of predicted high conservation value for forest fauna, and include many large areas of vegetated lands and important vegetation remnants. A framework of corridors is mapped to provide connectivity between these areas across the landscape.

It should be noted that vegetation cover in corridors may not always be continuous. Mapped corridors may include smaller remnants, wetlands, roadside vegetation, groups of trees, and even individual trees. Corridors may even be broken or fragmented by currently degraded or cleared areas and still contribute to landscape connectivity. Discontinuous corridors often provide important stepping-stone links and many are immediately identifiable as focus areas for habitat restoration programs.

6.2.7 Vertebrate pests

Under the Threatened Species Conservation Act the Scientific Committee has added feral cats to the key threatening processes list. Feral cats predate on small ground dwelling birds and mammals and are widespread across Australia. The National Parks and Wildlife Service are completing a threat abatement plan as a result of the feral cat impact to reduce numbers and hence reduce their impact. Many threatened species recovery plans within the Inverell Shire require the control of feral cat populations. A threat abatement plan for the predation by feral cats has been approved under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Feral goats compete with native fauna for food sources and shelter. They also consume native plants and cause damage to Aboriginal heritage sites. As a result of this behaviour the feral goat has been placed on the National Parks and Wildlife Service high priority pest issue list. Populations of feral goats have been located within the Inverell Shire. A threat abatement plan has been implemented for the competition and habitat degradation by feral goats and is approved under the EPBC Act 1999.

Feral pig populations have been located within the Inverell Shire and this has become a problem because they eat or destroy native plants and animals, wallow in, foul and disturb soils in dams, waterholes and other moist or swampy areas and dig for food. This behaviour has major impacts on vegetation and forest litter, particularly along drainage lines and around swamps and lagoons, or after rain when the ground is softer because they destabilise stream banks and accelerate erosion. Control techniques such as aerial shooting in conjunction with management plans with landholders are used by the National Parks and Wildlife Service. A threat abatement plan has been approved for the feral pig under the EPBC Act 1999.

Foxes are located right across the Inverell Shire and impact on medium sized mammals that live on the ground or partly in the trees, birds that nest on the ground and turtles. A fox abatement plan was released in 2001 by the National Parks and Wildlife Service because the species has been listed as a key threatening process. A threat abatement plan has been approved for the predation by the European red fox under the EPBC Act 1999.

Rabbit populations are located across the Inverell Shire and reduce the regeneration of native plants by grazing and ring-barking saplings, increase competition with native animals for food and shelter, damage historic and cultural sites through soil erosion caused by over-grazing, and provide food for other pest animals such as wild dogs, foxes and feral cats. The rabbit was listed as a key threatening process. Biological control such as the calicivirus and rabbit haemorrhagic disease (RHD), and mechanical methods such as warren ripping, rabbit proof fences, poisoning, trapping and shooting are used as control methods by the National Parks and Wildlife Service. A threat abatement plan has been approved for the competition and grazing of rabbits under the EPBC Act 1999.

Wild dog populations are not frequent throughout the Inverell Shire. Wild dogs hunt native animals, breed with purebred dingoes (which cause hybridisation of this native species), carry diseases and parasites and may compete with native carnivores such as quolls. Ground baiting, trapping, shooting, aerial baiting and dog proof exclusion fencing are some of the control methods used by the National Parks and Wildlife Service to reduce wild dog numbers.

Plague minnows are listed as a key threatening process. They consume frog spawn, attack tadpoles of native frogs, prey on aquatic macro-invertebrates, attack, injure and prey on native fish and compete with native animals for food. A threat abatement plan has been finalised for the predation by plague minnows under the EPBC Act 1999.

The Border Rivers – Gwydir Catchment Management Authority has a catchment target with the following aim:

‘By 2015 land managers have implemented management practices that reduce weeds and feral pests on 25 000 hectares.’

Native and exotic weeds, along with feral animals, have a significant negative impact on production and the environment. The intent of this target is to ensure that strategic investment occurs within the catchment that reduces the impact of weeds and feral pests.

Vertebrate pests are often dealt with by the National Parks and Wildlife Service and domestic pest/stray animals are dealt with by the Inverell Shire Council. Domestic pest/stray animals can impact on native species through competition, predation and the spread of disease. Cats and dogs are the main animals dealt with by Council and 311 dogs were impounded and 222 of these were euthanized in the 2007/2008 reporting period. 59 cats were handed in and of these 54 were euthanized.

6.3 Extent and degree of change to native vegetation

6.3.1 Vegetation Types – range and distribution

The most current vegetation mapping for the Western part of the LGA (the area covered by the 100 kilometre mapsheets of Yetman, Yallaroi and Bingara) is the Aerial Photo Interpretation (API) mapping undertaken as part of the Brigalow Belt South Bioregional Assessment. This mapping was completed in 2002. All vegetation over 10% crown cover percent (CCP) was mapped for the Yetman and Yallaroi mapsheets but the Bingara mapsheet only has mapping of public land. The mapping includes the attributes of vegetation cover percent, understorey / midstorey floristics, growth stage, special features, land use, disturbance and canopy floristics. The mapsheets of Inverell, Ashford and Texas have recent API vegetation mapping which covers the eastern part of the LGA. This mapping was completed in 2003 with the exception of the Inverell mapsheet which was completed in 2006.

The Basalt derived soils around Inverell support vegetation dominated by white box (*Eucalyptus albens*) and silver leaved ironbark (*Eucalyptus melanophloia*) grading to yellow box (*Eucalyptus melliodora*), rough barked apple (*Angophora floribunda*), Blakely's red gum (*Eucalyptus blakelyi*) and white cypress pine (*Callitris glaucophylla*) on lower slopes. Manna gum (*Eucalyptus viminalis*) can occur in the valleys with river oak (*Casuarina cunninghamiana*) along the streams.

There are 11 main vegetation communities in the Inverell Shire as follows.

- 1 New England Blackbutt Community – occurs predominately on granite or tertiary sediments. The community formation ranges from dry sclerophyll forest to woodland. Common species are stringybarks, blackbutts, yellow box, red gums and rough barked apples, kangaroo grass, barbed wire grass, three awned spear grass, tussock grasses, rats tail grass, tufted hedgehog grass, love grass, wallaby grass and prairie grass.
- 2 Yellow Box – Blakely's Red Gum Community – occurs on flat to undulating land with granite, basalt and sediment parent materials. It occurs as tall and savannah woodland often along drainage lines amongst other communities. Common associated species are rough barked apple, manna gum, stringybarks, white/black cypress, white box, ironbarks, orange gum, hill red gum, river red gum, river oak, three awned spear grasses, spiny headed mat rush, barbed wire grass, wallaby grass, slender rat tail, love grass, kangaroo grass, tufted hedgehog grass, pitted blue grass and spear grass.
- 3 White box Community – occurs on basalt, granite and sediment derived soils. The community's formation is savannah woodland to tall woodland. Common associated species are rough barked apple, blakely's red gum, yellow box, manna gum, grey box,

- stringybark, ironbark, kurrajong, wattle, Queensland blue grass, red leg grass, wallaby grass, kangaroo grass, panicum spp, stipa spp, windmill grass, silky brown top, three awned spear grass and love grass.
- 4 Silver leaf Ironbark – White Box Community – occurs on soils derived from sedimentary parent material. Common species include white box, yellow box, rough barked apples, stringybarks, ironbarks, red gums, cypress, white box, figs, Queensland blue grass, kangaroo grass and three awned spear grass.
 - 5 Narrow Leaf Ironbark – White Box Community – occurs on soils derived from sedimentary parent material. Similar species to the silver leaf ironbark – white box community.
 - 6 Smooth barked Apple Community – occurs on sandstone. The community's formation is woodland to tall dry sclerophyll forest. Associated species include kangaroo grass, windmill grass, love grass and three awned spear grass.
 - 7 Western Box Community – occurs on heavy alluvium soils. Common associated species include bumble box, pilliga box, yellow box, red gum, rough barked apple, river oak, redleg grass, windmill grass and panicum spp.
 - 8 White Cypress Pine – Silver leaved ironbark community – occurs on shallow granitic soils. The community's formation is tall woodland to shrub woodland. Common associated species are ironbarks, red gum, stringy barks, cypress, three awned spear grass and rats tail grass.
 - 9 Black Cypress Pine – Hill Red Gum – Ironbark Community – occurs on granite. The community's formation is woodland to dry sclerophyll forest with sparse grass cover. Common species include three awned spear grass, rats tail grass, barbed wire grass and spear grass.
 - 10 McKie Stringy Bark/Blackbutt Open Forest Community – occurs on Lateric soils. The community has an open forest structure and common species are *Eucalyptus* spp and *Callitris endlichen*.
 - 11 Howell Scrubland – Occurs on granite outcrops. They are dominated by low shrubs, grasses or trees. Common species include *Thomomorphus prolixus*, *Boronia granitica*, *Eucalyptus mckieana*, *Marotaxis macrophylla*, *Leianema rotundifolium* and *Acacia ranitica*.

Approximately 1.5 % of the Border Rivers – Gwydir Catchment total area is currently utilised for production forestry. In the Inverell Shire endangered and protected flora species are located on timbered land, regularly cultivated land and grasslands with most endangered species being located on the timbered lands. Many vulnerable species are located in regularly cultivated lands and there are more unprotected species in timbered lands and their surrounds. While threatened species are located across the Inverell Shire they are concentrated in timbered areas. Wetlands are located in the north west corner of the Inverell Shire and are subject to streambank erosion. There are protected riparian zones located in the south of the Shire where there is a greater extent of regularly cultivated land.

6.3.2 Percentage of woody and cleared land

Percent woody/cleared land	
% Cleared	73
% Woody vegetation	27

Table 19 - Percentage woody/cleared land in the Inverell LGA

Note: This has been derived from a grid put together by the Conservation Assessment and Data Unit in the Northern Directorate of the former National Parks and Wildlife Service. The data is dated November 2000. Woody Vegetation is defined as forest or woodland, native or exotic, with >20% canopy cover. Estuary vegetation, heathland, alpine

herbland, rock, lakes, swamp, watercourses, dams, reservoirs, built up areas, cleared land less than <20% canopy cover and natural non-woody vegetation such as grasslands are all attributed as Non-Woody.

Due to the large percentage of cleared land in the Border Rivers – Gwydir Catchment the Border Rivers – Gwydir Catchment Management Authority has introduced targets for vegetation as follows:

- By 2015 maintain the current extent of native vegetation in the catchment and improve the condition of an additional 50 000 hectares
- By 2015 increase the area actively managed for conservation by 25 000 hectares ensuring that priority is given to high conservation value vegetation and the recovery of threatened species, populations, communities and their habitats consistent with the *TSC Act* Priority Action Statement and the *EPBC Act*.
- By 2015 re – establish an additional 5000 hectares of native vegetation in the catchment through replanting and or natural regeneration (with priority given to improving the condition of remnant native vegetation within priority sub catchments)

The intent of the current extent of native vegetation target is to achieve a positive change in resource condition that is directly attributable to actions of the Border Rivers – Gwydir CMA. The biodiversity and native vegetation catchment target is designed to encourage actions that lead to an increase in endemic, native vegetation. The target also recognises the need for actions that result in more direct conservation outcomes, such as an increase in areas managed for conservation reserves and the implementation of recovery plans under the *TSC Act*, *Fisheries Management Act* and *EPBC Act*.

The actively managed for conservation target is aimed at terrestrial biodiversity and native vegetation. High conservation value areas are those that make a significant contribution to the conservation of biodiversity or cultural heritage and exhibit one or more of the following attributes: habitat for rare or threatened fauna and flora; relatively undisturbed structure and species composition; threatened or regionally rare communities, and traditional or contemporary cultural importance.

The intent of the additional native vegetation target is to strategically reintroduce native vegetation to existing areas that have been identified under the priority sub catchment system in Schedule 5. Managing areas for conservation and reducing illegal clearing through education campaigns can have a significant long term effect. Priority locations will include remnant native vegetation, eroded or salt affected land where revegetation or regeneration can reduce secondary degradation, or locations where the introduction of native over exotic pasture can increase biodiversity and provide the landholder with a more drought tolerant groundcover. Actions can include strategic plantings to join or increase the size of remnants, or buffers may be added between areas of high conservation value native vegetation and areas of intensive land use. Natural regeneration can be encouraged through de – stocking and/or strategic grazing.

6.3.3 Status of public and private land

Public and private land	Hectares	Percentage
Public Land – Conservation	20 733.4	2
Public Land – Other	30 767.1	4
Private Land – Conservation	0	0
Private Land – Other	808 264.8	94
TOTAL	859 764.4	100

Table 20 - Status of public and private land in the Inverell LGA

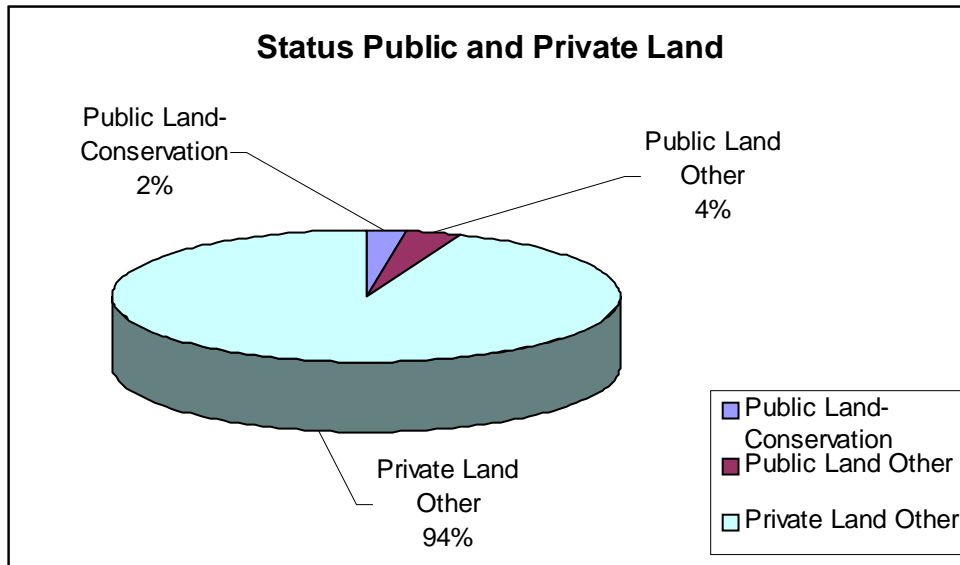


Figure 15- Status of public and private land

Note: Figure 12 has been derived from National Parks Estate, Forest Management Zones (in accordance with the Regional Forest Agreements), Public Land Data, Ramsar Data, and State Environment Planning Policy Nos. 14 and 26. Private Land Conservation includes land under Voluntary Conservation Agreements.

Interim Tree Preservation Order

An interim tree preservation order applies to certain environmentally sensitive land within the Council region. This order is recorded as a restriction as to user on the land title.

The effect of this Order is that no one may remove any trees from land affected by the order without first obtaining the approval of Council for the removal. The order prevents the ring – barking, cutting down, topping, lopping, removing, injuring or willful destruction of any tree or trees except with the consent of Council. If consent is given it is subject to conditions that Council sees fit.

The Inverell Shire Council impacts on biodiversity in a variety of ways. There are many sensitive areas in the shire which improve the abundance of native local flora and fauna; however the construction of infrastructure, buildings and widening roads usually results in the loss of some species' habitat. Threatened species need to be treated carefully, and management is required to protect them, particularly on roadsides. The Inverell Shire Council is bound to the *Threatened Species Conservation Act* in regards to development, and need to consider Ecologically Sustainable Development during the planning stage. Council can replant vegetation elsewhere as an offset for emissions. Road barriers are reduced to allow for fish crossings and bridges etc built so their piers do not restrict flow. Council has provided a variety of open spaces such as parks and sporting areas which provide habitat for local species and increase vegetation within the town. The Inverell Shire Council looks after the open spaces through maintenance, watering etc.

7 WASTE

All human activities generate waste. Appropriate management of this waste stream is necessary to ensure air and water quality: and non-degradation of habitat for flora and fauna.

These imperatives suggest that a philosophy of ‘avoidance, re-use and recycling’ should be characterise our approach to waste management.

Considering this philosophy, the following management principles will be utilised by Council:

- foster behavioural changes in generating solid waste
- encourage reuse and recycling to reduce consumption of resources and minimise transport costs
- Promote accounting for environmental costs in Council activities.

To avoid waste being diverted to landfill, Council is under increasing pressure from regulators and the community to implement strategies that recognise the waste hierarchy (see Figure 13) and place emphasis on avoidance, recovery and reprocessing activities. It is this pressure that is driving the evolution of ecologically sustainable waste minimisation and management practices.

The over-riding issue in all aspects of considering how best to minimise and manage waste is the application of the waste minimisation hierarchy within an ecologically sustainable framework. The waste hierarchy, enshrined in NSW Legislation and illustrated in Figure 13, goes from avoidance, reduction, reuse, recycling, treatment, disposal, with reducing environmental and financial benefit in that order. Waste avoidance and minimisation will deliver the most environmental, social and financial benefits, whilst disposal will deliver the least environmental, social and financial benefits.



Figure 16 - The waste hierarchy

7.1 Landfill Wastes

The Inverell Shire Council currently provides landfill sites at Inverell, Delungra, Gum Flat, Nullamanna, Bukkulla, Cherry Tree Hill, Bannockburn/Oakwood, Ashford, Elsmore, Yetman, Bonshaw, Graman and Wallangra.

During the reporting period approximately 5,000 tonnes of waste was deposited into the rural landfills throughout the Shire.

The Inverell Landfill located on Burtenshaws Road has been in operation as a landfill for approximately 40 years, however it has been estimated that the Depot could be finalized in approximately 2040. This is based on the current disposal volumes being received at the site. However Council is still endeavouring to maximise the amount of potential waste being recycled, which will increase the life of the landfill. In this reporting period approximately 12,000 cubic metres of waste was transported to the Inverell Landfill.

Major education efforts are being undertaken with all residents on “how to” and “what to” recycle. Waste is separated at the depot for all steel items, green waste, batteries, grass clippings, green waste, used oil, masonry, waste waters, fluorescent tubes, printer cartridges and mobile phones.

7.2 Hazardous and Toxic Chemicals

A chemical collection campaign has been held each year, (except 2002) with the following amounts of chemicals collected;

1999	2000	2001	2003	2004	2005	2006	2007	2008	2009	2010
2,426kg	1391kg	8,220.3kg	812.9kg	683.5kg	800kg	1,000kg	550kg	1000kg	1600kg	200kg

Table 21 - Amount (kilograms) of chemical collected by collection campaigns in the Inverell shire 199-2010

A positive reduction of chemicals in the community can be seen by the above results. The chemical collection is coordinated by the Northern Inland Regional Waste Group and since collections have commenced in 1999, 18,683.7 kg of chemicals have been collected from Inverell.

The Inverell Shire Council is a participant in drumMuster, an AgSafe Ltd Scheme which recovers the plastic drums that held agricultural chemicals for recycling. This ensures that the number of these drums is reduced in landfill and that they are eventually recycled once collected by Northaven. Drum compounds have been constructed at Delungra, Oakwood, Graman and Ashford.

7.3 Recycling

The construction in 2000 of the Materials Recovery Facility (MRF) located on Burtenshaws Road was designed to encourage users of the landfill to increase their recycling effort. This has been achieved through the introduction of charges on all non-separated domestic materials. Some recyclable trade waste is accepted without charge.

In the reporting period approximately 3,000 tonnes of waste was retrieved for recycling purposes which is an increase from the previous period. Since recycling has commenced approximately 8 years has been extended to the life of the waste depot. Therefore the more the community is encouraged to recycle the longer the life of the Inverell landfill. The introduction of the recycling 240 litre kerbside bins is reducing wastes having to be landfilled and increasing each year the percentage of recycling materials being able to be reused. Problems are still occurring with the type of contamination being found in the recycling bins. Again, an extensive advertising and education program has been implemented to try and minimize this practice.

MATERIAL	TONNES
Glass	327
Paper/Cardboard	1,877
Plastic	132.2
Ferrous Metal	57.3
Non Ferrous	23.5
Total	2,417

Table 22 - Recovered recyclable material in tones 2010/2011

Electronic waste is a major issue at Australian landfills and as a result Planet Ark has formed the 'Cartridges 4 Plant Ark' campaign. The campaign encourages the recycling of printer cartridges from printers, photocopiers, multi function centres and fax machines. This includes inkjet cartridges, laser cartridges, toner bottles, fuser and drum units, fax rolls, print heads, and waste hoppers/containers, collectors and kits. Four locations provide recycling boxes for this campaign in the Inverell Shire, including the Inverell Shire Council offices and the Landfill.

The Aussie Recycling Program is a mobile phone recycling program that provides a solution to clean up the environment and at the same time raising funds for charities. Mobile phones are quickly becoming a negative source of landfill and so this program is important for the environment. There are three locations within the Inverell Shire to place unwanted mobile phones, including the Inverell Shire Council offices.

The presence of mercury found in fluorescent tubes has prompted the requirement for recycling. Mercury can cause major land contamination. Inverell Council has available a container at the Inverell Landfill for the collection of these tubes.

In conjunction with Keep Australia Beautiful (NSW) a waste watchers program has been carried out over the last two years which educates students from kindergarten to year 6 on the benefits and the do's and don'ts of recycling including the advantages of what recycling can provide to the community. This program is available to all primary schools in the Shire and will be continued by Council judging from the positive comments being received.

The Inverell Shire Council provides infrastructure to deal with waste. Council has its own waste to deal with, including from its depot, main offices, and the town itself. Council provides bins within the towns to accumulate rubbish so litter is reduced. Green waste is turned into mulch and the solid waste landfill.

7.4 Sewage Treatment

Inverell Shire Council operates reticulated sewerage systems for Inverell, Delungra, Ashford and Gilgai. The systems are operated in accordance with the Department of Water and Energy, and the Department of Environment and Climate Change, guidelines and are monitored to ensure strict compliance with their requirements.

Inverell Sewerage Treatment Plant is an extended aeration system, Ashford and Delungra treatment plants and both Pasveer Channels and Gilgai plant comprises oxidation ponds.

The Inverell Sewerage Treatment plant is located off Delvyn Drive and the discharge of treated effluent is directed to the MacIntyre River.

Ashford, Delungra and Gilgai discharge into minor gullies and creeks which are part of a major catchment system.

Discharge quality is monitored to ensure compliance with environmental guidelines.

8 ENERGY SUSTAINABILITY

Human activity affects the amount of greenhouse emissions entering the atmosphere. The level of these emissions is a source of concern due to the impact on weather patterns and our biodiversity.

Council is a major consumer of energy. These practises adopted by Council can reduce energy usage, reduce costs and promote alternative energy sources.

In consideration of the impact greenhouse emissions have on the environment, the following energy management principles are to be utilised:

- Foster behavioural change in energy use across the community
- Maximise use of energy efficient products and processes in Council activities.

Strategy: *Reduce 'carbon footprint'*

Action:

- conduct energy audits
- develop greenhouse gas reduction strategy
- investigate carbon trading schemes and identify opportunities for Council

Strategy: *Encourage energy efficiency practises by the community*

Action:

- partner with other agencies to develop programs that encourage a reduction in total energy used by the community
- consider establishing a fund based on green power pricing for Council activities to address energy efficiency issues

Strategy: *Support the use and development of alternative energy sources*

Action:

- partner with Energy Generators to identify alternative energy sources

9 NOISE

The Inverell Shire has no major problems, nor complaints related to noise. As communities become increasingly urbanised, noise can intrude and affect lifestyles. Constant control of environmental noise is difficult, because the definition of offensive noise is usually subjective. The effects on people can differ, and range from psychological to physical depending upon the type of noise, the level and duration.

9.1 Community Noise

The main source of community noise complaints were dogs barking, with Council receiving 40 complaints during the reporting period.

9.2 Industrial Noise

The Department of Environment & Climate Change controls the licensing of most of the major industrial based companies in the shire, and has responsibility for noise based complaints. Council receives very few industry based complaints, however will deal with any situation as required.

The Inverell Shire Council produces noise through its use of machinery and infrastructure. The community is made aware of projects that will cause a disturbance to the baseline noise level and controls are put in place to determine the times that are allowable for construction etc. Council impact on noise through managing noise levels (decibels) that correspond to time periods.

10 HERITAGE

All heritage areas, structures and items can be threatened by development and resource use activities including agricultural, forestry, mining and extraction industries, roadworks and urban construction and development. Council follows the Heritage Assessment Branch's best practice guidelines to reduce the impact of new development on any heritage items. Council does employ a Heritage Advisor (Consultant) who works in conjunction with the NSW Heritage Office and assesses all applications made to Council relating to items of Environmental Heritage and development within the conservation zones. All conservation zones are recorded in the Local Environment Plan, 1988.

There are a number of heritage lists that identify different sites, including the list that is currently part of Council's Local Environmental Plan. There is a need to review these lists and compile one reference to heritage items in the LGA that can flow into the new LEP. The heritage value of the Main Street is an important part of the town of Inverell and it is essential that this streetscape be maintained. The streetscape should form part of any new review. There are two buildings listed on the State Heritage Inventory under the NSW Heritage Act in the Inverell Shire. These are the Inverell Post Office on Otho Street and the Inverell Shire Council Building (former) on Byron Street. An extra 161 items in the Inverell Shire are recorded as being listed in the State Heritage Inventory by the Inverell Shire Council.

The National Parks and Wildlife Service manages all Aboriginal heritage items in the Shire. Inverell Shire Council, in conjunction with the Heritage Council of New South Wales, commissioned *Resource and Environmental Services* in 1985, to undertake a study of the heritage of the Shire of Inverell. The document reports on the significant features of the heritage of the Shire including the natural environment, the built environment and the cultural implications of the pre-European and European settlement within the Shire.

10.1 Aboriginal Heritage

There were several known Aboriginal tribes associated with the Northern Tablelands area. The Anaiwan tribe, which was known to be the main tribe, occupied the central area of the tablelands (Byrne 1983). Howell (1982) surmised the extent of the Kwiambal tribe, which occupied from just north of Nullamanna and Bukkulla, north to the line of the hills Bowman's Sugarloaf and Heatherington's Sugarloaf, from east of the Macintyre River near Graman and the junction of Macintyre and Severn Rivers eastward to the line of the Hills marked by the Sugarloaf and Paddy's Sugarloaf. It was noted in the Environmental Impact Statement for Transgrid (QLD Interconnection) 1998, that there are 50 Aboriginal archaeological sites within several kilometres of the corridor for the power lines.

The Border Rivers – Gwydir Catchment Management Authority has implemented a target which aims to 'By 2015, facilitate the engagement of the community in collaborative actions that will improve natural resource management and productivity across the catchment.'

Involving the Aboriginal community in natural resource management will provide benefits to all members of the community. Aboriginal people have a strong desire for the wider community to gain an understanding and of Aboriginal cultural heritage. This mutual understanding and respect will enhance the implementation of targeted programmes with outcomes that benefit the whole community. An initial management action under this target is to set up an Aboriginal Reference Group that will provide input into this target.

10.2 Aboriginal Sites in the Shire

Information provided by the National Parks and Wildlife services is contained in the table below:

Site Feature	Number
Aboriginal Resource and Gathering	-
Aboriginal Ceremony and Dreaming	15
Art (Pigment or Engraved)	41
Artefact	184
Burial	4
Ceremonial Ring (Stone or Earth)	5
Conflict	2
Earth Mound	-
Fish Trap	-
Grinding Groove	22
Habitation Structure	-
Hearth	-
Non-Human Bone and Organic Material	-
Ochre Quarry	1
Potential Archaeological Deposit (PAD)	6
Shell	-
Stone Arrangement	1
Stone Quarry	7
Modified Tree (Carved or Scarred)	16
Water Hole	-
Total	304

Table 23 - Number of Aboriginal Sites and Nature of Aboriginal Sites

b) No. of sites altered, destroyed, damaged.

No. of licenses - 1

Notes: Licenses under the *National Parks and Wildlife Act* (1974) are required for works which could impact on Aboriginal Heritage either positively or negatively. Licenses are required not only for activities which may destroy or damage objects or places, but for conservation works or relocation of Aboriginal heritage objects.

10.3 Non Aboriginal Heritage

Inverell is the main centre in an area opened up by Scottish-born Alexander Campbell, who ventured into the New England in 1835 and established both Byron and Inverell stations. His homestead site was the junction of the Macintyre River and the Swan Brook, named because of the swans he had seen in the vicinity. The town of Inverell has its beginning when Colin and Rosanna Ross arrived in August 1853 to start a store for settlers who had moved into the district.

The architectural style of the Inverell Shire includes a wide variety of styles ranging from early colonial, Italianate, Baronial and Romanesque Revival, Edwardian, Federation and Modern.

Inverell has a proud pioneering past which is noticeable by the town centre with its beautifully restored buildings. In keeping with Council's recognition of the importance of Inverell's town centre as an historical and tourism asset, current signage codes control permissible signage above awnings. There are also investigations being currently undertaken regarding the possible extension of the present conservation zone further along Byron Street. The Inverell CBD is a significant resource and every attempt should be made to ensure that fragmentation of the shopping centre does not occur.

The Inverell Shire Council Public Library provides collections of preserved archives and conserved local history materials for the community. The Library actively collects local history materials and genealogical materials that focus on the Inverell Shire local area.

Bibliography

State Environment Planning Policies

State Environment Planning Policies are released by the State Government (Department of Planning) and many of these apply to Inverell Council.

Those that apply to Council's area are:

SEPP No.1 Development Standards

SEPP No.4 Development Without Consent and Miscellaneous Exempt and
Complying Development

SEPP No.6 Number of Stories in a Building

SEPP No.15 Rural Landsharing Communities

SEPP No.21 Caravan Parks

SEPP No.22 Shops and Commercial Premises

SEPP No.30 Intensive Agriculture

SEPP No.32 Urban Consolidation (Redevelopment of Urban Lands)

SEPP No.33 Hazardous and Offensive Development

SEPP No.36 Manufactured Home Estates

SEPP No.44 Koala Habitat Protection

SEPP No.55 Remediation of Land

SEPP No.60 Exempt and Complying Development

SEPP No.64 Advertising and Signage

SEPP No.65 Design Quality of Residential Flat Development

SEPP (Building Sustainability Index: BASIX) 2004

SEPP (Housing for Seniors or People with a Disability) 2004

SEPP (Major Development) 2005

SEPP (Mining, Petroleum Production & Extractive Industries) 2007

SEPP (Infrastructure) 2007

SEPP (Temporary Structures & POPE) 2007

SEPP (Exempt & Complying Development Codes) 2008

SEPP (Rural Lands) 2008

SEPP (Affordable Rental Housing) 2009

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Department of Primary Industries NSW – Fisheries

Department of Water and Energy

Department of Environment and Climate Change - National Parks & Wildlife Service

Border Rivers – Gwydir Catchment Management Authority

Catchment Management Authorities NSW

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Australian Bureau of Statistics

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Appendices

Appendix 1.

List of Figures

Figure 1 - Inverell LGA Population Numbers 1996-2006.....	6
Figure 2 - Bushfire Affected Land in Inverell Shire	16
Figure 3 - St Johns Wort (<i>Hypericum perforatum</i>)	21
Figure 4 - Mother of Millions (<i>Byrophyllum</i> sp.).....	21
Figure 5 - Public and Private Land Status	30
Figure 6 - Border Rivers - Gwydir Catchment Management Authority Area	36
Figure 7 - River Snail Shell.....	43
Figure 8- Distribution of <i>Notopala sublineata</i>	43
Figure 9- Purple Spotted Gudgeon.....	44
Figure 10 - Distribution of <i>Mogurnda adspersa</i>	44
Figure 11 - Olive Perchlet	44
Figure 12 - Distribution of <i>Ambassis agassizii</i>	44
Figure 13 - Silver Perch	45
Figure 14 - Distribution of <i>Bidyanus bidyanus</i>	45
Figure 15- Status of public and private land	77
Figure 16 - The waste hierarchy.....	78

List of Tables

Table 1 - Meteorological information for Inverell Shire 1995-2011 (Source:www.bom.gov.au/climate/averages/tables/cw_056242.shtml).....	7
Table 2 - Number of OSSM applications to Inverell Shire Council.....	22
Table 3 - Comparative Building Figures based on Development Applications and Complying Development Applications in Inverell Shire, 1993 - 2011	23
Table 4 - Land Capability Classes for Australia	24
Table 5 - Current Mining Titles within Inverell Shire (Source: Department of Primary Industries)	26
Table 6 - Property Sales for the Inverell Shire, 1998 – 2007	27
Table 7 - Rural Property Sales for the Inverell Shire, 1998 - 2007	27
Table 8 - Residential Sales for the Inverell Shire, 1998 - 2007.....	28
Table 9 - Village Property Sales for the Inverell Shire, 1998 - 2007	28
Table 10 - Commercial Property Sales for the Inverell Shire, 1998-2007	29
Table 11 - Industrial Property Sales for the Inverell Shire, 1998 - 2007.....	29
Table 12 - Miscellaneous Property Sales for the Inverell Shire, 1998 - 2007.....	29
Table 13 - National Parks Lands within the Inverell Shire under the <i>Brigalow</i> and <i>Nandewar Community Conservation Act</i> 2005	33
Table 14 - Overview of priority actions for the Inverell Shire for threatened species	49
Table 15 - High priority actions for threatened species in the Inverell Shire.....	55
Table 16 - Medium priority actions for threatened species in the Inverell Shire	61
Table 17 - Low priority actions for threatened species in the Inverell Shire	64
Table 18 - Regional corridors in North East NSW.....	72
Table 19 - Percentage woody/cleared land in the Inverell LGA	75
Table 20 - Status of public and private land in the Inverell LGA	76
Table 21 - Amount (kilograms) of chemical collected by collection campaigns in the Inverell shire 199-2010	79
Table 22 - Recovered recyclable material in tones 2010/2011.....	79
Table 23 - Number of Aboriginal Sites and Nature of Aboriginal Sites	83

List of Maps

Map 1 - Drought Map for NSW - May 2011	7
Map 2 - Predicted potential mean annual sheet and rill erosion rates for NSW	13
Map 3 - Current knowledge of distribution of sodic soils and sodic soil profiles in NSW	19
Map 4 - Acidification hazard for agricultural land in NSW	19
Map 5 - Percentage exceedences of total phosphorous levels compared to guideline levels at NSW sites	40
Map 6 - Health of the fish community	46
Map 7 - Potential impacts of NSW large dams releasing cold water	47

List of Graphs

Graph 1 - 100 years of annual rainfall, Inverell NSW.....	8
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Appendix 2.

List sorted by CONTROL CLASS

Noxious Weeds List effective 28 February 2007

Noxious Weeds Act 1993, Order #20 (Government Gazette 110 Aug 31 2006) and Order #22 (GG34 Feb 28 2007) specify the following declared noxious weeds and respective control objectives for the local control authority areas of Inverell Shire:

Control measures Class 1:

The plant must be eradicated from the land and the land must be kept free of the plant.

The control objective for weed control class 1 is to prevent the introduction and establishment of those plants in NSW.

Section 8(3) of the Act specifies that Control Class 1 plants are **notifiable**. This means, *inter alia*, the presence of a Control Class 1 plant on the land must be notified to the local control authority (Council) within three (3) days of detection. A **notifiable** category also means the plant or plant material cannot be sold, propagated or knowingly distributed.

See page 5 for more information on legal obligations in respect of notifiable weeds.

Common name	Scientific name	Control Class
Anchored water hyacinth	<i>Eichhornia azurea</i>	1*
Black knapweed	<i>Centaurea nigra</i>	1*
Broomrapes	<i>Orobanch</i> species except native <i>O. cernua</i> var. <i>australiana</i> and <i>O. minor</i>	1*
Chinese violet	<i>Asystasia gangetica</i> , subsp. <i>micrantha</i>	1*
East Indian hygrophila	<i>Hygrophila polysperma</i>	1*
Eurasian water milfoil	<i>Myriophyllum spicatum</i>	1*
Hawkweed	<i>Hieracium</i> species	1*
Horsetail	<i>Equisetum</i> species	1*
Hymenachne	<i>Hymenachne amplexicaulis</i>	1*
Karoo thorn	<i>Acacia karroo</i>	1*
Kochia	<i>Bassia scoparia</i> (asn <i>Kochia scoparia</i>)	1*
Lagarosiphon	<i>Lagarosiphon major</i>	1*
Mexican feather grass	<i>Nassella tenuissima</i> (asn <i>Stipa tenuissima</i>)	1*
Miconia	<i>Miconia</i> species	1*
Mimosa	<i>Mimosa pigra</i> (Not to be confused with "mimosa bush" - <i>Vachellia farnesiana</i> - previously known as <i>Acacia farnesiana</i>)	1*
Parthenium weed	<i>Parthenium hysterophorus</i>	1*
Pond apple	<i>Annona glabra</i>	1*
Prickly acacia	<i>Acacia nilotica</i>	1*
Rubbervine	<i>Cryptostegia grandiflora</i>	1*
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	1*
Siam weed	<i>Chromolaena odorata</i>	1*
Spotted knapweed	<i>Centaurea maculosa</i>	1*
Water caltrop	<i>Trapa</i> species	1*
Water lettuce	<i>Pistia stratiotes</i>	1*
Water soldier	<i>Stratiotes aloides</i>	1*
Witchweed	<i>Striga</i> species ex <i>Striga parviflora</i> and other native species	1*
Yellow burrhead	<i>Limnocharis flava</i>	1*

Control measures Class 2:

The plant must be eradicated from the land and the land must be kept free of the plant.

The control objective for weed control class 2 is to prevent the introduction and establishment of those plants in parts of NSW.

Section 8(3) of the Act specifies that Control Class 2 plants are **notifiable**. This means, *inter alia*, the presence of a Control Class 2 plant on the land must be notified to the local control authority (Council) within three (3) days of detection. A **notifiable** category also means the plant or plant material cannot be sold, propagated or knowingly distributed.

[See page 5 for more information on legal obligations in respect of notifiable weeds.]

Common name	Scientific name	Control Class
Alligator weed	<i>Alternanthera philoxeroides</i>	2*
Mesquite	<i>Prosopis</i> species	2*
Parkinsonia	<i>Parkinsonia aculeata</i>	2*
Salvinia	<i>Salvinia molesta</i>	2*
Water hyacinth	<i>Eichhornia crassipes</i>	2*

Control measures Class 3:

The plant must be fully and continuously suppressed and destroyed.

The control objective for weed control class 3 is to reduce the area and the impact of those plants in parts of NSW

Common name	Scientific name	Control Class
Giant Parramatta grass	<i>Sporobolus indicus</i> var. <i>major</i>	3
Green cestrum	<i>Cestrum parqui</i>	3
Serrated tussock	<i>Nassella trichotoma</i>	3*
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	3
St John's wort	<i>Hypericum perforatum</i>	3

Control measures Class 4:

The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

The control objective for weed control class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW. See CC4A, CC4B, CC4C as follows:

Control Class 4A

CC4A MANAGEMENT PLAN – Legal requirements within the Shire of Inverell:

The growth and spread of the plant must be controlled by conducting an on-going and effective treatment program to reduce plant numbers and to minimise the plant's negative impact on the land. Boundaries and waterways must be kept free of the plant to prevent spread from the property. All reasonable measures are to be taken to ensure vehicles, machinery and livestock moved off the property are free of the plant.

Common name	Scientific name	Control Class
African boxthorn	<i>Lycium ferocissimum</i>	4A
Nodding thistle	<i>Carduus nutans</i>	4A
Pampas grass	<i>Cortaderia</i> spp.	4A
Rhus tree	<i>Toxicodendron succedaneum</i>	4A
Paterson's curse, vipers/Italian bugloss	<i>Echium</i> spp.	4A
Sweet briar	<i>Rosa rubiginosa</i>	4A

Control class 4B*

As for CC4A **plus** plants cannot be sold, propagated or knowingly distributed.

CC4B MANAGEMENT PLAN – Legal requirements within the Shire of Inverell:

The growth and spread of the plant must be controlled by conducting an on-going and effective treatment program to reduce plant numbers and to minimise the plant's negative impact on the land. Boundaries and waterways must be kept free of the plant to prevent spread from the property. All reasonable measures are to be taken to ensure vehicles, machinery and livestock moved off the property are free of the plant. Plant must not be sold, propagated or knowingly distributed.

Common name	Scientific name	Control Class
Blackberry	<i>Rubus fruticosus</i> (agg.spp.)	4B*
Chilean needle grass	<i>Nassella neesiana</i>	4B*
Harrisia cactus	<i>Harrisia</i> spp.	4B*
Mother of millions	<i>Bryophyllum</i> spp.	4B*

Control class 4C*

For plants for which suitable biological control agents may be appropriate.

CC4C MANAGEMENT PLAN – Legal requirements within the Shire of Inverell:

The growth and spread of the plant must be controlled by conducting an on-going and effective treatment program to reduce plant numbers and to minimise the plant's negative impact on the land. Any biological control (#) or other control program directed by the local control authority must be implemented. Boundaries and waterways must be kept free of the plant to prevent spread from the property. All reasonable measures are to be taken to ensure vehicles, machinery and livestock moved off the property are free of the plant. Plant must not be sold, propagated or knowingly distributed.

Common name	Scientific name	Control Class
Prickly pear (includes rope pear, tiger pear, common pest pear, smooth tree pear & velvety tree pear – excludes Indian fig)	<i>Cylindropuntia</i> and <i>Opuntia</i> spp. except <i>O. ficus indica</i> (Indian fig)	4C*

(#) Any decision to implement a weed biological control program needs to be assessed on a property-to-property and/or area-to-area basis. Biological control is a slow, long-term control measure. It can be very effective in dealing with large infestations, particularly in inaccessible areas. But, it is generally NOT recommended for new, small or isolated infestations because biological control will not necessarily contain the problem. These types of infestations should be dealt with by conventional means ie manual removal, burn/bury or herbicide application.

It is also important to note that any biological control program requires manual assistance at certain times of the year to promote insect build-up and distribution. Talk to your local council weeds officer for advice on how to gain optimum results from the use of biological control agents.

Control class 4D

Legal requirements within the Shire of Inverell:

The plant must be controlled where it impacts on normal agricultural practices including cropping and pasture management

Common name	Scientific name	Control Class
Galvanised burr	<i>Sclerolaena birchii</i>	4D

Control measures Class 5:

The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

[Please see definition of ‘notifiable weed’ page 5]

The control objective for weed control class 5 is to prevent introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

Common name	Scientific name	Control Class
African feather grass	<i>Pennisetum macrourum</i>	5*
African turnip weed (2 types)	<i>Sisymbrium runcinatum</i> , <i>S. thellungii</i>	5*
Annual ragweed	<i>Ambrosia artemisiifolia</i>	5*
Arrowhead	<i>Sagittaria montevidensis</i>	5*
Artichoke thistle	<i>Cynara cardunculus</i>	5*
Athel tree/Athel pine	<i>Tamarix aphylla</i>	5*
Bear-skin fescue	<i>Festuca gautieri</i> (asn <i>Festuca scoparia</i>)	5*
Bridal creeper	<i>Asparagus asparagoides</i> (asn <i>Myrsiphyllum asparagoides</i> also <i>Asparagus medeoloides</i>)	5*
Burr ragweed	<i>Ambrosia confertiflora</i>	5*
Cabomba	<i>Cabomba caroliniana</i>	5*
Cayenne snakeweed	<i>Stachytarpheta cayennensis</i> (asn <i>Stachytarpheta urticifolia</i>)	5*
Clockweed	<i>Gaura parviflora</i> (Note <i>G. lindheimeri</i> removed 20 Oct 08)	5*
Corn sowthistle	<i>Sonchus arvensis</i>	5*
Dodder	All <i>Cuscuta</i> species except the native species <i>C. australis</i> , <i>C. tasmanica</i> and <i>C. victoriana</i>	5*
Espartillo	<i>Achnatherum brachychaetum</i> (asn <i>Stipa brachychaetum</i>)	5*
Fine-bristled burr grass	<i>Cenchrus brownii</i>	5*
Fountain grass	<i>Pennisetum setaceum</i>	5*
Gallon's curse	<i>Cenchrus biflorus</i>	5*
Glaucous star thistle	<i>Carthamus glaucus</i>	5*
Golden thistle	<i>Scolymus hispanicus</i>	5*
Lantana	<i>Lantana</i> species	5*
Long-leaf willow primrose	<i>Ludwigia longifolia</i>	5*
Mexican poppy	<i>Argemone mexicana</i>	5*
Mossman River grass	<i>Cenchrus echinatus</i>	5*
Onion grass	All <i>Romulea</i> species and varieties except <i>R. rosea</i> var. <i>australis</i>	5*
Oxalis	All <i>Oxalis</i> species and varieties except the native species <i>Oxalis chmoodes</i> , <i>O. exilis</i> , <i>O. perennans</i> , <i>O. radicata</i> , <i>O. rubens</i> and <i>O. thompsoniae</i>	5*
Red rice	<i>Oryza rufipogon</i>	5*
Sagittaria	<i>Sagittaria platyphylla</i> (asn <i>Sagittaria graminea</i>)	5*
Sand oat	<i>Avena strigosa</i>	5*
Smooth-stemmed turnip	<i>Brassica barrelieri</i> subspecies <i>oxyrrhina</i> (asn <i>Brassica oxyrrhina</i>)	5*
Soldier thistle	<i>Picnemon acarna</i>	5*
Texas blueweed	<i>Helianthus ciliaris</i>	5*
Willows	<i>Salix</i> species except <i>S. babylonica</i> , <i>S. x reichardtii</i> , <i>S. x calodendron</i>	5*
Yellow nutgrass	<i>Cyperus esculentus</i>	5*

Noxious Weeds Act 1993**Summary of legal requirements in respect of “notifiable weed”**

(1) an occupier of land (other than a local control authority) on which there is a notifiable weed must notify the local control authority for the land of the fact within 3 days after becoming aware that the notifiable weed is on the land (Noxious Weeds Act 1993 - s.15, s.16)

With respect to Control Class 5 weed material, however, notifications are only relevant where the weed has appeared on the land as a result of trade (e.g. dodder contamination in a newly-acquired bale of hay). Legal action may be taken against the vendor

(2) a person must not sell or purchase any notifiable weed material or any animal or thing which has on it, or contains, notifiable weed material, knowing it to be, or to have on it or to contain, any such weed material. (S.28.1)

(3) an occupier of land (including a public authority) must not knowingly remove or cause to be removed from the land any animal or thing which has on it, or contains, notifiable weed material (s.28.2)

(4) an occupier of land (including a public authority) must not use or permit the land to be used for the purpose of disposing of, transporting or selling soil or turf, if the occupier knows, or ought reasonably to have known, that there is a weed on the land that is a notifiable weed in any part of the State (s.29)

(5) a person must not scatter or cause to be scattered on any land or water any notifiable weed material, knowing it to be such weed material (s.30)

(6) a person must not knowingly transport or move or use an agricultural machine that has on or in it a weed that is a notifiable weed in any part of the State (s.32).

Appendix 3**Fauna – Threatened Species – Inverell LGA**

Class/Family	Scientific Name	Common Name	<i>Threatened Species Conservation Act 1995 Listing</i>
Amphibia			
Hylidae			
	<i>Litoria booroolongensis</i>	Booroolong Frog	E1
Aves			
Acanthizidae			
	<i>Pyrrholaemus saggitatus</i>	Speckled Warbler	V
Accipitridae			
	<i>Lophoictinia isura</i>	Square tailed kite	V
Anatidae			
	<i>Nattapus coromandelianus</i>	Cotton Pygmy Goose	E1
	<i>Oxyura australis</i>	Blue billed duck	V
Cacatuidae			
	<i>Calyptorhynchus lathami</i>	Glossy black cockatoo	V
Ciconiidae			
	<i>Ephippiorhynchus asiaticus</i>	Black necked stork	E1
Climacteridae			
	<i>Climacteris picumnus</i>	Brown treecreeper	V
	<i>Climacteris picumnus victoriae</i>	Brown treecreeper (eastern subsp.)	V
Columbidae			
	<i>Geophaps scripta</i>	Squatter pigeon	E1 - V
Estrildidae			
	<i>Poephila cincta cincta</i>	Blackthroated finch (southern subsp.)	E1
	<i>Stagonopleura guttata</i>	Diamond firetail	V
Megapodiidae			
	<i>Alectura lathami</i>	Australian Brush turkey population in the Nandewar and Brigalow Belt South Bioregions	E2
Meliphagidae			
	<i>Grantiella picta</i>	Painted Honeyeater	V
	<i>Melithreptus gularis gularis</i>	Black chinned honeyeater (eastern subsp.)	V

	<i>Anthochaera phrygia</i>	Regent Honeyeater	E1
Petroicidae			
	<i>Melanodryas cucullata</i>	Hooded Robin	V
Pomatostomidae			
	<i>Pomatostomus temporalis temporalis</i>	Grey crowned Babbler (eastern subsp.)	V
Psittacidae			
	<i>Lathamos discolor</i>	Swift Parrot	E1
Strigidae			
	<i>Ninox connivens</i>	Barking Owl	V
	<i>Ninox strenua</i>	Powerful Owl	V
Tytonidae			
	<i>Tyto novaehollandiae</i>	Masked Owl	V
Mammalia			
Dasyuridae			
	<i>Dasyurus maculatus</i>	Spotted tailed quoll	V
Emballonuridae			
	<i>Saccolaimos flaviventris</i>	Yellow bellied sheath tail bat	V
Macropodidae			
	<i>Macropus dorsalis</i>	Black striped wallaby	E1
	<i>Petrogale penicillata</i>	Brush tailed rock wallaby	E1
Molossidae			
	<i>Mormopterus 'Species Six'</i>	Hairy nosed freetail bat	E1
	<i>Mormopterus beccarii</i>	Baccari's freetail bat	V
Muridae			
	<i>Pseudomys delicatulus</i>	Delicate Mouse	E1
Petauridae			
	<i>Petaurus norfolcensis</i>	Squirrel Glider	V
Phascolarctidae			
	<i>Phascolarctos cinereus</i>	Koala	V
Pteropodidae			
	<i>Pteropus poliocephalus</i>	Grey headed flying fox	V
Vespertilionidae			
	<i>Chalinolobus nigrogriseus</i>	Hoary wattled bat	V
	<i>Chalinolobus</i>	Little Pied Bat	V

	<i>picatus</i>		
	<i>Falsis trellus tasmaniensis</i>	Eastern false pipistrelle	V
	<i>Miniopterus schreibersii oceanensis</i>	Eastern bentwing bat	V
	<i>Myotis adversus</i>	Large footed myotis	V
	<i>Nyctophilus timoriensis</i>	Eastern long eared bat	V
	<i>Scoteanax rueppellii</i>	Greater broad nosed bat	V
	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V
Reptilia			
Elapidae			
	<i>Hoplocephalus bitorquatus</i>	Pale headed snake	V
Gekkonidae			
	<i>Oedura rhombifer</i>	Zig zag velvet gecko	E1
	<i>Underwoodisaurus sphyrurus</i>	Boarder thick tailed gecko	V
Scincidae			
	<i>Anomalopus mackayi</i>	Five Clawed Worm-skink	E1

Flora – Threatened Species – Inverell LGA

Class/Family	Scientific Name	Common Name	Threatened Species Conservation Act 1995 Listing
Plants			
Araliaceae			
	<i>Astrochia roddii</i>	Rodd's Star Hair	E1
Asteraceae			
	<i>Picris evae</i>	Hawkweed	V
	<i>Rotidosis heterogama</i>	Heath wrinklewort	V
Capparaceae			
	<i>Capparis carescens</i>	Wild Orange	E1
Convolvulaceae			
	<i>Ipomoea</i>	Desert Cow Vine	E1

	<i>diamantinerisis</i>		
Cyperaceae			
	<i>Cyperus conicus</i>		E1
Fabaceae (Faboideae)			
	<i>Desmodium campylocaulon</i>	Creeping tick-trefoil	E1
	<i>Indigofera baileyi</i>	Bailey's Indigo	E1
Fabaceae (Mimosoideae)			
	<i>Acacia acrionastes</i>	Pindari Wattle	E1
	<i>Acacia jucunda</i>	Yetman Wattle	E1
	<i>Acacia macnuttiana</i>	McNutt's Wattle	E1
	<i>Acacia petraea</i>	lancewood	E1
	<i>Acacia pubifolia</i>	Velvet Wattle	E1
Myrtaceae			
	<i>Eucalyptus caleyi</i> <i>subsp. ovendenii</i>	Ovenden's Ironbark	V
	<i>Eucalyptus mckieana</i>	McKie's Stringybark	V
	<i>Eucalyptus nicholii</i>	Narrow leaved black peppermint	V
	<i>Eucalyptus rubida</i> <i>subsp. barbigerorum</i>	Blackbutt Candlebark	V
	<i>Homoranthus prolixus</i>	Granite homoranthus	V
	<i>Micronyrtus grandis</i>	Severn River Heath Myrtle	E1
Platyzomataceae			
	<i>Platyzoma microphyllum</i>	Braid fern	E1
Poaceae			
	<i>Dichanthium setosum</i>	Bluegrass	V

	<i>Digitaria porrecta</i>	Finger Picnic grass	E1
Polygalaceae			
	<i>Polygala linariifolia</i>	Nature milkwort	E1
Rhamnaceae			
	<i>Pomaderris queenslandica</i>	Scant Pomaderris	E1
Rutaceae			
	<i>Boronia granitica</i>	Granite Boronia	V - E
	<i>Zieria ingramii</i>	Keith's Zieria	E1
Santalaceae			
	<i>Thesium australe</i>	Austral toadflax	V
Surianaceae			
	<i>Cadellia pentastylis</i>	Ooline	V
Zamiaceae			
	<i>Macrozamia humilis</i>	Inverell Cycad	E1

Threatened Species Conservation Act 1995 Listing:

E1 – Endangered

E2 – Endangered population

V - Vulnerable