STATE OF THE ENVIRONMENT REPORT
2014

Contents

EXECUTIVE SUMMARY

This State of the Environment report is a comprehensive report which reviews the Glen Innes Severn Local Government Area environment over the last four years (2009-2013). State of the Environment reporting is required under section 428A of the NSW Local Government Act (1993). The purpose of preparing a State of the Environment report is to provide a summary of the attributes of the Local Government environment and the human impacts on that environment. Using the Pressure-State-Response model, the State of the Environment report addresses the eight environmental sectors of land, air, water, biodiversity, waste, noise, Aboriginal heritage and non-Aboriginal heritage.

Glen Innes Severn Local Government Area is located in the New England Tablelands of northern NSW and experiences cold winters and warm summers with most rainfall occurring during summer. In the past four years the population has increased 4.7% and unemployment has dropped to 6.4%. The main industries in the area include agriculture, retail trade, health and community and the tourism/service industry.

The State of the Environment report was undertaken using the guidelines laid down by the NSW government and also incorporated consultation with key stakeholders through a community workshop and written correspondence. The report was completed by Michelle McKemey of Melaleuca Enterprises who has 14 years experience in the field of environmental science. The report was reviewed in 2013 by Ian Trow, Trainee Environmental Officer with Glen Innes Severn Council under the oversight of Keith Appleby BSc BEngTech.

The report developed indicators for each environmental sector and used these indicators to provide an indication of the state of each of the eight environmental sectors. It is recommended that the indicators established through this report are used in future reports in order to provide continuity or reporting. The results for each environmental sector are listed below:

- Land

  Development application numbers have increased during the reporting period however the total number of rural subdivisions created has decreased. The protected area estate has increased during this time. This suggests that development is occurring in a balanced, appropriate manner.

- Water

  Water use has decreased overall during the reporting period, suggesting that water use efficiency is increasing. Waterways health should also have increased due to an increased effort devoted to fencing and protecting waterways.

- Biodiversity

  The indicators for the biodiversity sector show that community concern and possibly interest in biodiversity is increasing. Natural resource management programs such as revegetation programs have fluctuated over the years in accordance with funding available and prioritisation of work undertaken. A continued, constant investment in revegetation and biodiversity projects would benefit the biodiversity of Glen Innes Severn Local Government Area.

- Waste

It is difficult to draw strong conclusions due to lack of information regarding indicators, however Council has developed a strong recycling program over the last 17 years and continues to improve this system. Council has demonstrated progressive initiatives in dealing with waste generation and recycling.

- Air

  Most indicators for the air sector remained relatively stable during the reporting period. This is good news for the air quality of Glen Innes Severn Local Government Area.

- Noise

  Noise does not appear to be a significant issue in Glen Innes Severn Local Government Area due to the regulations applied through Council and NSW government agencies.

- Aboriginal Heritage

  A strong emphasis on local Aboriginal heritage is supported by involvement with the Glen Innes Local Aboriginal Land Council. Items of known heritage significance are recorded on the AHIMS database accessible on line. The Aboriginal Heritage Study proposed in the previous SOE report has since been completed and forms the basis of AHIMS registered sites.

- Non-Aboriginal Heritage

  The number of heritage sites listed on Council's heritage register is decreasing. This could be due to the delisting of sites or the damage or demolition of heritage items.

The report concluded that over the past four years, Glen Innes Severn Local Government Area has made substantial advances in environmental management. A progressive and growing waste recycling program, significant investment from natural resource management funding bodies, a substantial protected area estate, an increase in water efficiency, strong heritage program and a proactive community means that Glen Innes Severn Local Government Area is maintaining its environment in a good condition.

Glen Innes Severn Council is looking forward to further improving and protecting its environment through proposed major projects such as managing putrescibles waste currently disposed as landfill at Glen Innes Waste Management Facility. Acceptance of strategies such as the Glen Innes Severn Land Use Strategy will assist Council to efficiently plan and develop the Local Government Area.

The development of a waterways health monitoring program and a climate change strategy for the Local Government Area will further benefit Council and stakeholders in understanding potential environmental impacts and managing these.

Continued education and awareness building for Glen Innes Severn's community to facilitate their involvement and engagement in environmental issues should also be a high priority. For Council staff, knowledge of environmental best practice through training and workplace application should assist Council to maintain and improve its standard of environmental management.

Glen Innes Severn Local Government Area, with its high levels of biodiversity, strong heritage and well planned land management is in good stead to maintain its high environmental values and protect its natural heritage into the future.

INTRODUCTION

Purpose

Local Governments use State of the Environment reporting to identify and evaluate sustainability issues, to assist them to achieve ecologically sustainable development in their area. Ecologically sustainable development means an approach to using, conserving and enhancing natural resources so that ecological processes, on which all life depends, are maintained, and the total quality of life, now and in the future, is improved. Ecologically sustainable development means that our children and our children's children will inherit an earth with healthy natural resources to support them (NSW Government 1999).

State of the Environment reporting is required under section 428A of the NSW Local Government Act (1993). The purpose of preparing a State of the Environment report is to provide a summary of the attributes of the Local Government environment and the human impacts on that environment. It also provides a public record of the activities of government, industry and the community in protecting and restoring the environment. Local State of the Environment reports should be integrated with environmental management strategies for the local area.

This State of the Environment report is a comprehensive report which reviews the Glen Innes Severn Local Government Area environment over the last four years (2009-13). A comprehensive State of the Environment report is required to:

- Address the eight environmental sectors of land, air, water, biodiversity, waste, noise, Aboriginal heritage and non-Aboriginal heritage
- Provide for each environmental sector, as a basis of comparison in subsequent reports, a statement outlining the condition of the sector at the date of the report and makes the relevant comparison with the equivalent statement in the last (comprehensive) State of the Environment report;
- Report on all major environmental impacts and related activities, including management plans relating to the environment; special council projects relating to the environment; and the environmental impact of council activities (NSW Government 1999).

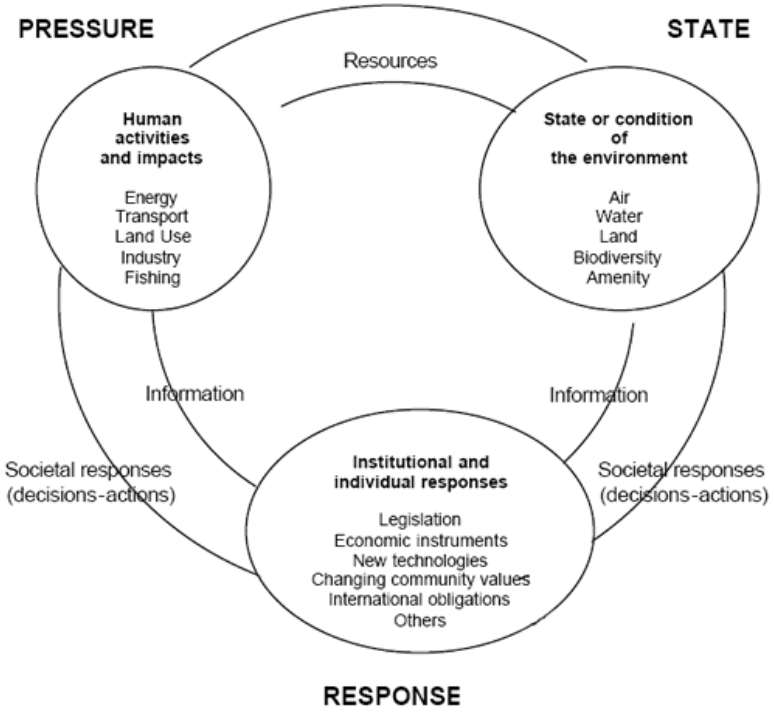
Method

Graham Price, Director of Development and Environmental Services Glen Innes Severn Council engaged Michelle McKemey of Melaleuca Enterprises Environmental Consultancy Services to undertake the comprehensive State of the Environment report for 2005-09. Michelle McKemey is an environmental scientist with 14 years experience in the profession. In 2013 that report has been reviewed by internal staff to examine the changes since that time and update accordingly.

The State of the Environment reporting was undertaken in accordance with the guidelines laid out in the NSW Government (1999) document 'Environmental Guidelines: State of the Environment Reporting By Local Government: Promoting Ecologically Sustainable Development'. These guidelines recommend that the 'Pressure-State-Response' method is used to identify the impacts, conditions and actions related to each of the eight environmental sectors- that is, land, air, water, biodiversity, waste, noise, Aboriginal heritage and non-Aboriginal heritage. 'Pressure' means the impacts that human activities have on their immediate environment and their natural surroundings. 'State' is defined as the current and projected state (or condition) of the environment. 'Response' refers to the response of councils,

government agencies, industries and communities to the pressures on, and state of, the environment (NSW Government 1999). These categories are interlinked, as can be seen in Figure 1.

Furthermore, Councils must identify and apply appropriate environmental indicators for each environmental sector, considering and applying the pressure-state-response model. An environmental indicator is defined as an aspect of the natural world or built environment that can be monitored to provide information on environmental conditions and trends. Environmental indicators include physical, chemical, biological and socio-economic measures of the environment (such as measurements of



contaminants in soil, of the health of fish species and of the number of motor vehicles per household) that can be used to assess natural resources and environmental quality (NSW Government 1999).

Figure 1: Pressure State Response model diagram (Quality Planning 2009)

Information was collated from Glen Innes Severn Council information sources and State and Federal Government agencies. Consultation with the Glen Innes Severn Council community and key stakeholders was undertaken through written correspondence and a Community Workshop held in Glen Innes on 20th October 2009. Key stakeholders included Glen Innes Severn residents, the Department of Environment, Climate Change and Water, New England Livestock Health and Pest Authority, Border Rivers Gwydir Catchment Management Authority, Northern Rivers Catchment Management Authority and Glen Innes Natural Resources Advisory Committee.

Outcomes of Community Consultation

The outcomes of community consultation are listed under each environmental sector. In addition to this, the community had the following vision for the environment of Glen Innes Severn Local Government Area:

- Glen Innes Severn Local Government Area has a close community of people who are educated about the environment, who care about the environment and take responsibility for the environment.
- Landholders are progressive in looking after the environment- they need education and support to continue to grow
- The community needs to continue to grow in its appreciation and understanding of the environment where we live, especially regarding:
    - Water use and quality
    - Habitat conservation- to value and re-establish important floral communities which should lead to the provision of habitat for wildlife
    - Both of the above values are under threat
- The action required includes more education and awareness of vital issues, including water, landscape, floral communities, care and retention
- New people coming to the area need to learn about the local environment.

Data Limitations

The most current data available has been used to undertake the State of the Environment report. In some cases, recent data was not available. This is explained further in the relevant sections.

BACKGROUND

Population and Employment

The population of Glen Innes Severn Local Government Area in June 2008 was 8,656 people. This represents a decrease in population of 5.4% since June 2008 when the last comprehensive State of the Environment report was undertaken. Population fluctuations since 2005 are summarised in Figure 2.

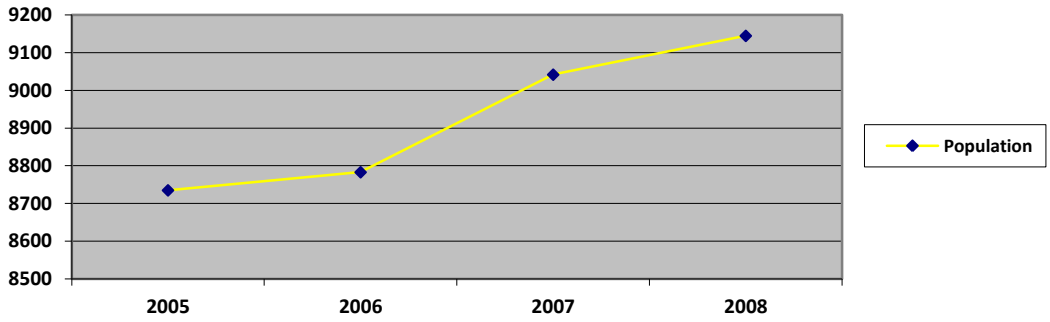


Figure 2: Glen Innes Severn Local Government Area Population 2005-2008 (Source: Australian Bureau of Statistics 2007a, 2007b, 2009a & 2009b)

The main industry in the Glen Innes Severn Local Government Area is agriculture (41.9%), followed by retail trade (14%), health and community services (12.1%) and tourism/service sector (32%).

Twenty-four per cent of the economic output of the Local Government Area is due to agriculture, whilst tourism is an important export sector. White collar workers make up 60% of the population and 40% are in industry-related business (Glen Innes Severn Council 2008).

Unemployment increased from 6.4% in 2006 to 6.7% in 2011(Australian Bureau of Statistics 2011).

Photo 1: Glen Innes township

Climate

Rainfall and temperatures vary throughout the Local Government Area, with the area generally experiencing warm summers and cool to cold winters, with a summer dominant rainfall pattern (GHD 2009). Table 1 summaries the climate averages for 2013.

Table 1: Climate Summary Statistics for Glen Innes, 2013 (Source: Bureau of Meteorology 2013)

Climate category	**Value**
Mean maximum temperature	19.4^{o}C
Mean minimum temperature	7.3^{o}C
Annual rainfall	847.4mm

Landscape

The Local Government Area extends from east of the Great Dividing Range where the land is divided by numerous gorges, rising to the top of the escarpment before descending to the west.

The topography is characterised by high ranges, ridgelines and low to undulating landscapes ranging between 150m and 1400m above sea level.

The valley floors and flat to undulating plains contain a mixture of intensive agriculture, cropping (mainly Lucerne and Maize) and grazing, whilst the upper slopes and hills remain heavily vegetated (GHD 2009).

Figure 3 shows a map of the Local Government Area.

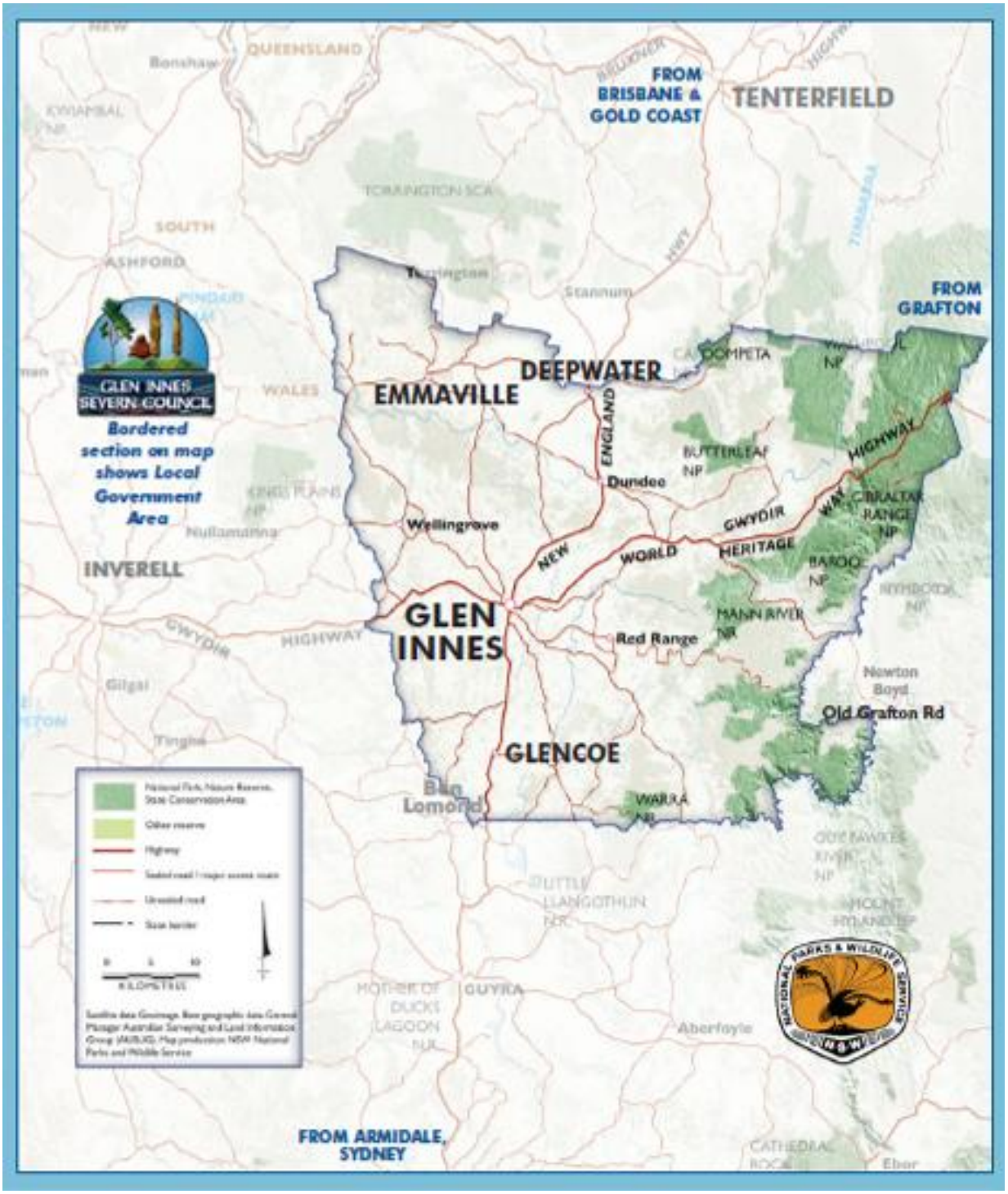


Figure 3: Map of Glen Innes Severn Local Government Area (Source: Glen Innes Severn Council 2008)

LAND

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the land sector is presented in Tables 2, 3 and 4. These issues are discussed further under the ensuing headings.

Table 2: Summary of Pressures, States and Responses for the Land Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Agriculture Mining Residential & Commercial Development Climate change	Soil health Land degradation Land contamination Protected Area Estate Development Stocking rates	GLENRAC (e.g. 16.5ha soil erosion works in 2009) Catchment Management Authorities Glen Innes Severn Council Land Use Strategy Glen Innes Severn Council operational procedures

Table 3: Summary of Potential Indicators for the Land Sector

Potential Indicator	**Potential Measurement**
Soil health	Fertiliser use (total tonnes)
Area of degraded land	Area (hectares)
Stocking rates	Dry Sheep Equivalent per hectare
Level of community concern regarding contaminated sites and/or land in general	Number of calls received by Environment Line
Number of contaminated sites	Number of sites listed on the contaminated sites record under the Contaminated Land Management Act
Level of development	Number of developments assessed
Level of appropriate development	Number of development approvals related to rural subdivisions
Protected Area Estate	Area of land managed as protected area by National Parks And Wildlife Service (hectares)

Table 4: Indicator Values 2005 – 2009 for the Land Sector

Indicator (units)	2005/06	2006/07	2007/08	2008/09	Trend
Level of community concern regarding contaminated sites and/or land in general (number of calls received by Environment Line)	0	1	0	0	Negligible change
Number of contaminated sites (number of sites listed on Contaminated Sites Record)	1	1	1	1	Stable
Level of development (Total number of developments assessed)	129	146	160	171	Consistently Increasing
Number of rural subdivisions (number of new lots created)	Unknown	39	22	20	Decreasing
Protected Area Estate (ha)	107,393	?	?	107,507	Slight increase

Introduction

The wise use of land in the Glen Innes Severn Local Government Area is fundamental to maintaining the livelihoods, lifestyle and environment of the Local Government Area. The Local Government Area covers an area of 5,642 km^2 and includes the district centre of Glen Innes and the villages of Deepwater, Emmaville, Glencoe, Red Range and Dundee (GHD 2009).The major land use outside of these urbanised areas is agriculture, accounting for 70% of the total land use area (GHD 2006).

Photo 2: Glen Innes Severn Local Government Area's thriving agriculture industry

As the largest industry, agriculture accounts for 41.9% of the local economy. This industry is based primarily on beef cattle, sheep and lambs, pigs, wool and a thriving apiary industry, supported by fertile soils and a safe rainfall (Glen Innes Severn Council 2008). Other major land uses include residential development, commercial development, forestry, protected areas and mining.

Land use can be strongly influenced by the type and quality of soils in the region. As a part of the New England Bioregion, the soils of Glen Innes Severn Local Government Area are described as:

> 'Siliceous sands derived from granites are found among rock outcrops. Red earths and mellow texture contrast soils of relatively low fertility and poor structure are widespread across the bioregion and are prone to erosion. Soils with increased organic matter occur in swampy sedgelands in valleys. These soils support a variety of open forests and woodlands.
>
> In basalt areas, shallow stony loams are found on steep areas and deep, red brown and brown to black, fertile, well-structured loams are found on flatter slopes. Soils are sometimes waterlogged in valley floors. Siliceous sands and red earths occur on associated Tertiary sands and gravels.
>
> Harsh texture contrast soils in the bioregion derived from Permian sedimentary rocks are generally yellow, thinner and stonier on steep slopes. Some areas of slightly saline soils also occur.'
>
> Source: NSW National Parks and Wildlife Service (2003).

Pressure

Pressures are defined as human activities and impacts. The main human activities that may impact on land in the Glen Innes Severn Local Government Area include agriculture, mining, climate change and residential and commercial development. The impacts of these activities can include land degradation and contamination, and inappropriate land use.

State

'State' in this context refers to the current state or condition of the land in Glen Innes Severn Local Government Area. State can potentially be measured through indicators such as soil health, stock carrying capacity (measured in dry sheep equivalents per hectare), area of degraded land (measured in hectares), number of contaminated sites (measured as the number of sites listed on the contaminated sites register under the Contaminated Land Management Act), level of appropriate land use (measured as the number of development approvals related to rural subdivisions), level of community concern regarding contaminated sites (measured as the number of calls received by Environment Line) and the area of Environmentally Sensitive Land (measured as the area of land in hectares declared as Environmentally Sensitive). These potential indicators are summarised in Table 3.

Each of the potential indicators of the state of land is discussed below:

Soil Health

The health of soils throughout the Local Government Area could provide significant insights into the state of the land. Issues such as top soil retention, use of fertilisers, soil moisture, nutrient and microorganism retention, soil carbon and ground cover all contribute to the overall health of soils. Unfortunately very little of this information is documented and therefore it is difficult to use soil health as a measurable indicator for the state of land. However much effort is devoted to improving soil health throughout the Local Government Area and while it is not possible to use soil health as an indicator, it is worthwhile to document the responses to this issue in Glen Innes Severn Local Government Area. This is discussed further in the response section.

Land Degradation

It is estimated that soil erosion occurs in the area at a constant rate of 52 t $km^{-2}a^{-1}$ (Gale & Haworth 2004). The area of land which has been degraded due to soil erosion, salinity, acidification, silt, water logging and raised water tables and degradation of remnant vegetation, can provide an insight into the state of the land. In past State of the Environment reports this information was provided by the Soil Conservation Service. This Service no longer exists and this information is no longer readily available. Therefore while this historical information is interesting (Table 5), it cannot be used as an indicator unless comparable, current data can be produced. Thus land degradation is not included in the indicator values summary table (Table 4). As with soil health, there has been a substantial response in the Local Government Area to land degradation issues, so this is discussed further in the response section.

Table 5: Land degradation within Glen Innes Severn Local Government Area represented by area and proportion of the Local Government Area (Source: Soil Conservation Service in Glen Innes Severn Council 2006)

TYPE	AREA (ha)	% SHIRE
Soil Erosion e.g. Water, Gullying	48,632	14.09
Induce Soil Salinity	<70	<1
Soil Acidification	Not known	Not known
Acid Sulphate Soils	Nil	Nil
Silt	Not known	Not known
Water Logging And Raised Water Tables	Not known	Not known
Degradation Of Remnant Vegetation	Not known	Not known

Land contamination

The number of sites and level of community concern regarding land contamination can provide a measurable indicator of the state of land in the Glen Innes Severn Local Government Area.

During 2008/09, Council and the NSW Department of Environment, Climate Change and Water (DECCW) received no complaints or calls to the Environment Line regarding contaminated land or land in general. In previous years (2005/06, 2006/07 and 2007/08), no calls were received regarding contaminated land. One call was received regarding land in general during 2006/07. This indicates that the community has a low level of concern regarding contaminated sites.

Five Environment Protection Licences under the Protection of the Environment Operations Act were registered within the Shire during 08/09, as well as during previous years 2005/06, 2006/07 and 2007/08. One of the licenses (for pig accommodation) was surrendered during 2008/09.

One contaminated site within the Shire is listed on the contaminated sites record under the Contaminated Land Management Act. This is the Glen Innes Gasworks which received a notice in regard to this issue, the notice was later revoked.

Protected Area Estate

From 2005 to 2009, the area of land in Glen Innes Severn Local Government Area that is managed as protected area increased from 107,393 hectares to 107,507 hectares. This is an increase in area of 114 hectares. This increase is relatively modest in comparison to previous years, where the protected area estate increased significantly.

The reason for this could be the conversion of State Forests to National Parks which occurred through the Regional Forest Agreement process from 1997 to 2005. Since that time, the growth of the protected area estate has slowed down (Toms S. 2009 *pers. comm*. 9th Nov).

Development

The number of development applications assessed can give an indication of development pressures on the land. While development in regional areas is often welcomed, it is important that this development is undertaken in an appropriate manner. Rural subdivisions can sometimes lead to land use conflict issues, such as a clash of competing rural/urban values or loss of productive agricultural land. Therefore the number of rural subdivision development applications approved per year can provide a general indicator of development rates and potential land use conflict issues.

During 2008/09 Glen Innes Severn Council assessed 171 development applications, of which 60 applications were for single dwellings, 24 applications were for commercial developments, 7 applications were for industrial developments and 73 applications were for complying development.

During 2007/08, Glen Innes Severn Council assessed 160 development applications, of which 16 were for single dwellings, 15 applications were for commercial developments, 5 were for industrial developments and 74 applications were for complying development.

During 2006/07, Glen Innes Severn Council assessed 146 development applications, of which 30 were for single dwellings, 23 applications were for commercial developments, 2 were for industrial developments and 91 applications were for complying development.

During 2005/06, Glen Innes Severn Council assessed 129 development applications, of which 20 were for single dwellings, 20 applications were for commercial developments, 3 were for industrial developments and 86 applications were for complying development.

In total, 20 new lots were created through rural subdivision approvals in 2008/09, 22 new lots were created in 2007/08, 39 new lots were created in 2006/07 and no data is provided for 2005/06.

Information for development rates and new lots created through rural subdivision approvals are presented in Figures 4 & 5.

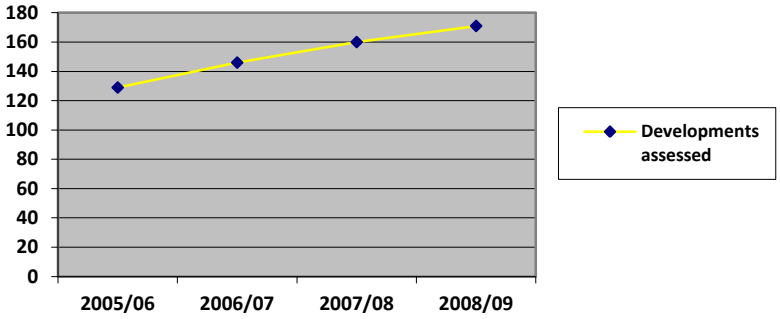


Figure 4: Total number of developments assessed in Glen Innes Severn Local Government Area from 2005-2009

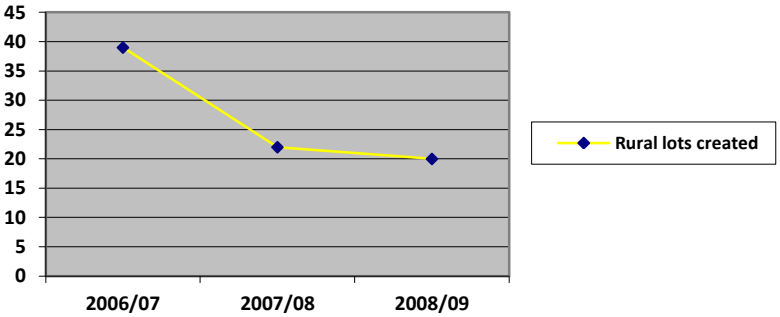


Figure 5: Total number of new lots created through rural subdivisions in Glen Innes Severn Local Government Area from 2006-2009

The figures about indicate that while development is steadily increasing in Glen Innes Severn Local Government Area, the number of new rural lots created is decreasing. If potential rural-urban conflict is to be used as an indicator of sustainable land use, then this indicates that land use is being planned and implemented effectively.

Stock Carrying Capacity

It is estimated that stocking rates are increasing in the Local Government Area due to pasture improvement, except for those areas that have been affected by drought. Stocking rates average 5-6 DSE/ha with a range of 0.25 DSE/ha to 10DSE/ha in the Local Government Area (Peter Frizell 2009 *pers. comm.* 26th October). Actual data showing an annual average stocking rate throughout the Local Government Area is not available and therefore stock carrying capacity cannot be used as a comparable, quantifiable indicator.

Response

A number of programs and policies related to planning, land rehabilitation, education and on-ground management have been implemented by various agencies in response to pressures on the land in Glen Innes Severn Local Government Area. These are discussed below.

Glen Innes Severn Land Use Strategy 2009

The draft Glen Innes Severn Land Use Strategy was finalised in February 2009 and placed on public exhibition during May-June 2009. At the time of writing, comments were being incorporated into the final report. The Glen Innes Severn Land Use Strategy was developed to provide a comprehensive strategic planning framework for the Glen Innes Severn Local Government Area that reflects the current and future needs of the

community. The outcomes of the Strategy provided a framework for future land use planning in the Glen Innes Severn Local Government Area and will guide the preparation of a new shire-wide Local Environmental Plan (GHD 2009).

The Glen Innes Severn Land Use Strategy has the following guiding principles:

- Promoting land use efficiency
- Supporting and protecting rural futures
- Supporting employment and economic development
- Caring for the natural environment and heritage
- Providing quality facilities and services
- Improving transport and infrastructure provision (GHD 2009).

The value of a Strategy is that it:

- Shows the public what Council is aiming for;
- Shows how Council expects to achieve it;
- Helps Council staff interpret and administer regulations intended to achieve the strategy; and
- If followed, enables all developments that Council approves, as well as its own actions, to be consistent (GHD 2009).

This strategy will assist Council in its response to the land use pressures which primarily result from inappropriate development.

Glen Innes Severn Council Operational Procedures

Glen Innes Severn Council updates its operational procedures to keep pace with environmental best practice. During 2008/09, Council used the Road Traffic Authority Guidelines for environmental management on road maintenance and construction. Glen Innes Severn Council staff are trained in environmental management procedures developed by the Road Traffic Authority. Staff have also been trained in environmental management through training programs run by the Catchment Management Authorities. A Trainee Environmental Officer has been employed since 2012.

The TEO has been tasked with the role of education and support for other Council staff in relation to sedimentation and erosion control procedures, fisheries issues and general environmental advice.

During 2011/2012 and 2012/2013, Council identified the following land issues, key actions and recommendations:

- Continue membership of key committees and organizations
- Continued maintenance on site control measures in fossicking areas and produce information leaflet for distribution to the tourist centre along with accommodation venues
- Maintain appropriate budget allocations within financial constraints for environmental management activities and initiatives

- Continue to encourage local rehabilitation initiatives by private individuals and groups

- Continue existing programs with respect to noxious weeds and review plant and equipment propagation risks

Photo 3: Roadside soil erosion caused by floods
(Photo: Malcolm Donnelly)

Glen Innes Natural Resources Advisory Committee (GLENRAC)
GLENRAC works within the Shire to facilitate natural resource management. Council has a position on the Board of GLENRAC and works with the Committee to implement natural resource management within the Shire.

During 2012/2013 GLENRAC implemented the following projects (often in partnership) to deal with the pressures placed on land in Glen Innes Severn Local Government Area:

- Northern Rivers Catchment Management Authority: Honey Locust eradication program

- Secured 19 new projects valued at $464,662.50
- Assisted 10 land managers secure $105,056 of direct grants
- Hosted 8 workshops and 11 field days attended by 362 land managers
- 5 publications, 53 e/flashes and 6 newsletters
- 21 books donated to the Glen Innes Severn library.

As is evident from the list of projects above, GLENRAC has played an active and successful role in the Glen Innes Severn community, promoting sustainable land use practices. The financial support and range of projects entrusted to GLENRAC appears to be growing and thus will assist the community to progress further in their response to land pressures.

Northern Rivers Catchment Management Authority

The Northern Rivers Catchment Management Authority covers the eastern region of the Shire and has the vision of 'Communities in the Northern Rivers area aim for a healthier, more resilient landscape and a community that is actively engaged in maintaining and restoring natural resources to sustainable levels'. The Northern Rivers CMA released the Catchment Action Plan CAP2 in April 2013, which includes the following five strategies:

Strategy 1: Engage and support the

community to build capacity and

partnerships

Strategy 2: Manage landscapes and

seascapes

Strategy 3: Sustain livelihoods

Strategy 4: Enrich lifestyles and culture.

Strategy 5: Manage for change to enable

the community and government to

effectively carry out NRM.

Border Rivers Gwydir Catchment Management Authority

The BRGCMA covers the western region of the Shire and has a vision based on four broad elements that comprise a socio-ecological system. The elements of the Vision are interconnected and co-dependant, with changes within one part of the system flowing on to all others. Figure 3 represents the interconnected nature of the Vision, with resilient, adaptive communities at its core.

Sustainable productive lands, balanced hydrological systems, connected biodiverse landscapes, resilient adaptive communities.

Conclusions

The Glen Innes Severn Local Government Area is experiencing increasing development which is good for the economy in regional areas. This development appears not to be increasing pressures on issues such as rural-urban values conflict, by limiting the number of rural subdivisions occurring. Development control could be improved through the finalisation and acceptance by Council of the Glen Innes Severn Council Land Use Strategy which is in the final stages of completion.

A large proportion of Glen Innes Severn Local Government Area is devoted to protected area estate which fortifies the environmental values of the area and balances land degradation and contamination issues associated with agriculture, mining, forestry and development.

Glen Innes Severn Local Government Area is also fortunate to be home to a pro-active Land Care network and many enthusiastic land holders who wish to manage the environment in a sustainable manner. Support and collaboration from agencies such as the Catchment Management Authorities further enhances the community and government's commitment to environmental sustainability.

WATER

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the water sector is presented in Tables 6, 7 and 8. These issues are discussed further under the ensuing headings.

Table 6: Summary of Pressures, States and Responses for the Water Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Agriculture	Salinity	Saleyards runoff treatment
Mining	Pollution	Rocky Ponds Creek
Sewage	Turbidity & Siltation	Stormwater
Climate Change	Litter	Wetlands
Feedlots	Sewage	Fish Population Health
Saleyards	Erosion	Water use efficiency
Residential, commercial, industrial and rural development	Habitat	Sewerage Treatment Plant
		Council infrastructure
Inefficient water use & consumption		Water quality monitoring

Table 7: Summary of Potential Indicators for the Water Sector

Potential Indicator	**Potential Measurement**
Water use	Kilolitres (kL) water treated at Glen Innes Water Treatment Plant per year
Water quality	Compliance/non compliance with Sewage Treatment Plant licence requirements
Waterways protected	Kilometres (km) of fencing constructed to protect waterways
Level of community concern regarding water	Number of calls received by Environment Line regarding water
Waterway health	Basic water quality parameters such as dissolved oxygen, nitrogen, phosphorus, potassium, turbidity, bacterial concentration and hydrocarbons, monitored through a waterway health program

Table 8: Indicator Values 2005 – 2009 for the Water Sector

Indicator (units)	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**Trend**
Water use (kL)	653,715	607,250	657,583	639,070	Stable
Water quality (compliance/non-compliance with POEO licence)	compliant	compliant	compliant	compliant	compliant

Introduction

Maintaining water in sufficient supply and of adequate quality is essential to human life, the environment and the economy. Local governments are responsible for the provision of domestic water supply in addition to the provision of water drainage management.

Four major river systems flow through Glen Innes Severn Local Government Area. These systems include the Mann River, (flowing from above Lake Llangothlin just over the southern boundary of the Local Government Area to become a major feeder branch of the Clarence River), Beardy Waters (which includes its tributaries including Furracabad and Reddestone Creeks, which flow to the Severn River to join the inland Darling River system); the Severn River and the Deepwater River (flows west and north to join the Mole River eventually reaching the Darling) (GHD 2009).

Domestic water supply for Glen Innes Severn Local Government Area is sourced from the Glen Innes Water Supply Catchment, covering an area of 227km^2 and the Deepwater Water Supply Catchment, covering an area of 217km^2 (Figure 6). The Glen Innes town water supply has a nominal capacity of 688 mega litres.

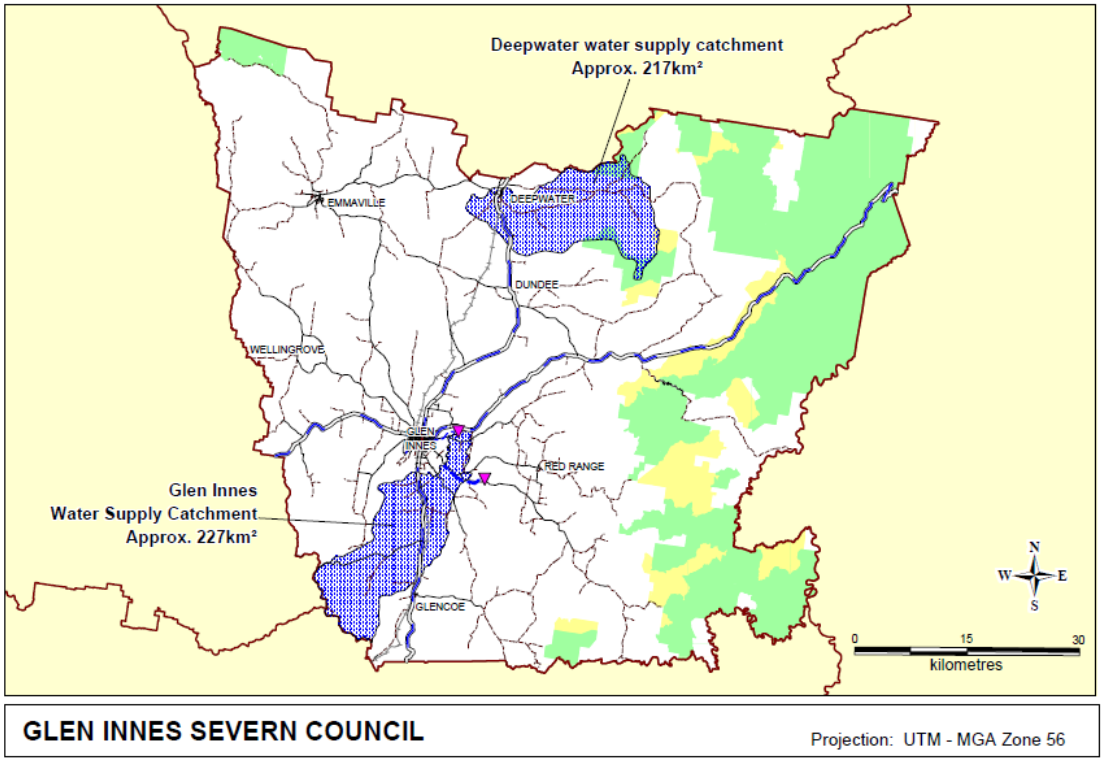


Figure 6: Water Supply Catchment Areas of Glen Innes Severn Local Government Area (Source: Glen Innes Severn Council)

Pressure

The main pressures, or human activities, that may impact on water in the Glen Innes Severn Local Government Area include agriculture, mining, sewage, climate change, residential, commercial, industrial and rural development, saleyards and feedlots.

Agriculture can impact on the state of water by activities such as pasture top dressing, effluent and agricultural farming activities which add nutrient loads and erosion due to accelerated run off in sloping country. Salinity can be associated with certain agricultural practices and salinity impacts on ground and surface waters are evident in some areas of Glen Innes Severn Local Government Area.

Mining sites have a point discharge and erosion impact and depending on the type of mine the need for remediation may be immediate, that is arsenic and sulphur discharges to waterways.

Pollution from sewage treatment plants or on-site septic systems may be a threat to waterways and human health. Council has completed a risk assessment workshop for drinking water supplies in Glen Innes and Deepwater in 2013.

Residential, commercial, industrial and rural development can lead to litter and pollution entering waterways through the storm water drainage system which may threaten water systems. Potential development or degradation of sensitive areas such as wetlands is a threat to the Shire's water systems. Increased siltation and turbidity are problems that can be caused from inadequate erosion and sediment control on construction worksites.

Inefficient water use and consumption for both domestic and industrial uses can lead to water shortages and wastage.

The CSIRO predict that climate change will lead to more extreme rainfall events, overall drier conditions, warmer water temperatures and reduced stream flows. This could lead to an increase in algal blooms, increased salinity problems, water contamination from increased fire activity, ecological impacts from reduced stream flow and less runoff into significant wetlands (CSIRO 2007). The Department of Environment, Climate Change and Water predict that by 2050, climate change will lead to a hotter climate (mean minimum temperatures predicted to increase by 2-3^{o}C) an increase in rainfall in all seasons except winter (+5-10% rainfall in summer, autumn and spring, -5-10% rainfall in winter), drier conditions in all seasons except summer (due to increased evaporation), an increase in frequency and intensity of flood-producing rainfall events and a slight increase in water runoff (DECCW 2008a).

Photo 4: A wild river in Glen Innes Severn Local Government Area (Photo: Malcolm Donnelly)

State

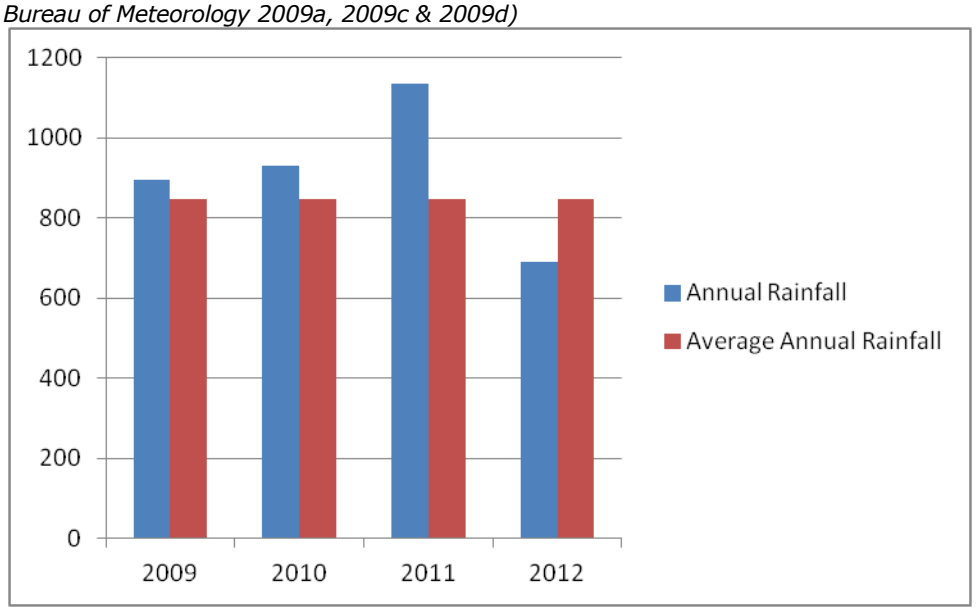
'State' in this context refers to the current state or condition of the water in Glen Innes Severn Local Government Area. State can potentially be measured through indicators such as water use (measured in Kilolitres (kL) water treated per year at Glen Innes Water Treatment Plant), water quality (measured in compliance/non compliance with Sewage Treatment Plant licence requirements), waterway health (measured in kilometres (km) of fencing constructed to protect waterways and/or basic water quality parameters such as dissolved oxygen, nitrogen, phosphorus, potassium, turbidity, bacterial concentration and hydrocarbons, monitored through a waterway health program) and level of community concern regarding water (measured as the number of calls received by Environment Line). These potential indicators are summarised in Table 7.

Each of the potential indicators of the state of water is discussed below:

Water use

The mean annual rainfall for Glen Innes is 847.4mm per year (Bureau of Meteorology 2013). Rainfall over the period 2009-2013 compared to mean rainfall is shown in Figure 7. This data is based on meteorological information collected at the Glen Innes Post Office.

Figure 7: Annual rainfall compared with mean rainfall for Glen Innes Post Office 2006-08 (Source: Bureau of Meteorology 2009a, 2009c & 2009d)



Water use by the Glen Innes community can be measured as the quantity of water treated at the Glen Innes Water Treatment Plant from 2005-09 (Table 9). This table shows that water use has remained stable over this period.

Table 9: Treated Water produced at Glen Innes Water Treatment Plant 2009-2013

Year	**Treated Water Produced (kL)**
2009/2010	653,715
2010/2011	607,250
2011/2012	657,583
2012/2013	639,070

Water quality

The state of water quality in Glen Innes Severn Local Government Area can be measured by the indicator of compliance/non-compliance of the Glen Innes Sewage Treatment Works with its licence requirements under the *Protection of the Environment Operations Act 1997* (POEO Act). This indicator tells us whether Council is fulfilling its responsibilities to manage sewage and ensuring no pollution is released from the Sewage Treatment Works. Table 10 shows Council's compliance/non-compliance with its licence requirements for the Glen Innes Sewage Treatment Works under the POEO Act.

Table 10: Compliance of Glen Innes Sewage Treatment Works with conditions of licence under POEO Act

Year	Treated Water Quality
2009/2010	Compliant
2010/2011	Compliant
2011/2012	Compliant
2012/2013	Compliant

Table 10 indicates that the Glen Innes Sewage Treatment Works has been able to meet the conditions of its licence under the POEO Act.

Waterway health
In order to judge the state of waterway health, two indicators can be used: waterways protected, measured in kilometres (km) of fencing constructed to protect waterways and/or basic water quality parameters such as dissolved oxygen, nitrogen, phosphorus, potassium, turbidity, bacterial concentration and hydrocarbons, monitored through a waterway health program.

Communication concern over water issues
The level of community concern regarding water and stormwater can provide a measurable indicator of the state of water in the Glen Innes Severn Local Government Area.

During 2009-2013, Council and the NSW Department of Environment, Climate Change and Water (DECCW) received no complaints or calls to the Environment Line regarding water or stormwater.

This indicates that community concern is decreasing regarding water however the community still maintains some concern regarding water issues.

Response

A variety of responses by various groups have been implemented between 2009 -2013 to ensure that the condition of water in the Glen Innes Severn Local Government Area is improving. A number of responses are detailed below.

Saleyards runoff treatment
The Furracabad Creek has a rural runoff in the upper reaches and there are areas of possible pollution and injection of high nutrients being caused by the saleyards truck wash runoff and effluent from the sewerage treatment works where it enters the creek at the Rocky Ponds Creek/Furracabad Creek junction. A program was set in place to prevent saleyards and truck wash runoff from entering the Furracabad Creek. Two sediment dams have been installed to collect all the water run off from the truck wash and the sale yards. These dams are pumped on to the neighbouring racecourse to water the grass with high nutrient water.

Photos 5 and 6: Truck wash and sediment trap for sales yard

Possible pollution by the saleyards has been recognised by Council and steps have been taken to alleviate this problem. See below photo 7 of settling dams.

Photo 7: Retention Pond for sale yards high nutrient water to be sprayed on racecourse

Water sampling has been taken on a monthly basis to meet the DECCW Licensing Guidelines.

Wetlands

Wetland Care Australia funded a project that mapped the location of natural wetlands across Glen Innes Severn Shire. These maps are incorporated into any engineering design work that is undertaken to ensure if a wetland is present this is acknowledged in the report and design undertaken appropriately.

BRGCMA has funded four projects to protect wetlands within Glen Innes Severn Shire since its inception. These grants have focused on the montane peat wetlands and have included actions such as excluding stock, revegetation programs and weed management programs.

Council has a mapping system which indicates where wetlands are located in the Local Government Area which informs planning and development.

Photo 3: Small wetland in Glen Innes Severn Local Government Area

Fish population health

Any Council works undertaken near waterways (e.g. bridge construction or maintenance) are only undertaken after relevant fisheries permits are obtained. Council has a mapping system which indicates where fisheries habitat is located in the Local Government Area which informs planning and development.

The NSW Department of Primary Industries is responsible for managing fish (including aquatic invertebrates) and fish habitat throughout NSW and provided the information in Table 12 regarding fisheries ecosystem issues for Glen Innes Severn Local Government Area.

Table 12: Fisheries information for Glen Innes Severn Local Government Area

Category	**Number/type**
Road crossings	32 (2 high priority)
Weirs	13
Threatened species	River snail (Notopala sublineata), Silver perch (Bidyanus bidyanus), Purple Spotted Gudgeon (Mogurnda adspersa), Olive perchlet (Ambassis agassizii)

Water use efficiency

Council infrastructure

During 209/2010, Council completed a major campaign to reduce water leakage from Council's reticulated water system. This program aimed to reduce water pressure in identified zones and to investigate leakage sources, in order to reduce water leakage and overall water consumption.

Sewage treatment plant

In 2007/08, Council installed a new five million dollar sewage treatment plant. This increased the efficiency of sewage treatment and improved the water quality of effluent released from the plant.

In 2012, Council adopted its sewerage incident management protocol whereby any accidental sewer overflow was reported to relevant parties concerned, the public was informed and appropriate steps were taken to manage the incident.

Water quality monitoring
Council undertakes water quality monitoring as required for licensed operations such as the Landfill site and Sewage Treatment Plant. Council occasionally undertakes water quality monitoring for the public when requested, on a cost recovery basis.

A general water quality monitoring program to monitor the ecological health of urban or rural waterways is not currently undertaken. It is hoped that GLENRAC will develop a water quality monitoring program to monitor waterways health (dams and rivers/creeks/streams) on private land.

Conclusions

There is good news for the state of water in Glen Innes Severn Local Government Area. The indicators show that water use is stable, which means that water efficiency has been maintained. This is attributed to water efficiency programs and increased awareness in the community regarding the important of wise water use. Community concern regarding water has decreased overall which could indicate that the community is more satisfied with water issues in the Local Government Area.

Waterway health should also be increasing due to the protection of waterways through an increased fencing effort. A waterways health monitoring program was not undertaken during the reporting period but it is hoped that GLENRAC will establish such a program in future. This is an important issue that needs to be addressed, and both urban and rural waterways should be monitored. Collaborative funding from the Catchment Management Authorities or other sources could assist in the development of this program.

Insufficient information regarding the quality of water in Glen Innes Severn Local Government Area was provided to allow a conclusion on water quality, however future water quality should improve due to the installation of Council's new $5million sewage treatment plant.

If each of the above trends for water continue, then the water sector should continue to improve in Glen Innes Severn Local Government Area.

BIODIVERSITY

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the biodiversity sector is presented in Tables 13, 14 and 15. These issues are discussed further under the ensuing headings.

Table 13: Summary of Pressures, States and Responses for the Biodiversity Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Feral animals Recreational activity Vegetation clearing Fire Weeds Climate change	Remnant vegetation Threatened species & communities Species diversity Community interest Wildlife habitat corridors High sensitivity habitat Protected area estate	Glen Innes Severn Council Land Use Strategy GLENRAC: revegetation, habitat creation, biodiversity workshops Fire Management Weed Management Feral Animal Management CMAs: Native Vegetation Act & biodiversity projects Roadside Management Guide Glen Innes Severn Council Tree Removal Policy Glen Innes Severn Council Recreation and Open Spaces Management Plan State Environmental Planning Policies High Conservation Value areas on Travelling Stock Routes

Table 14: Summary of Potential Indicators for the Biodiversity Sector

Potential Indicator	**Potential Measurement**
Area of native vegetation cleared per year (ha)	Area of vegetation cleared (in hectares) reported through Property Vegetation Plans notified to Council from Northern Rivers Catchment Management Authority and Border Rivers Gwydir Catchment Management Authority
Areas known to have been revegetated (ha)	Area of land revegetated (in hectares) as reported through Catchment Management Authorities and Land Care
Extent of protected areas (ha)	Area of land protected for nature conservation (in hectares)
Level of community concern regarding biodiversity	Number of calls received by Environment Line
Actions taken to improve the conservation of specific species of flora and fauna listed under the TSC Act and other legislation	Number of actions listed through Threatened Species Recovery Plans
Actions taken to minimise the impact or reverse the spread of species of declared noxious weeds	Number of weeds targeted
Actions taken to minimise the impact or reverse the spread of species of declared feral animals	Number of feral animals targeted
Total fauna and flora species recorded	Total number of species listed for Glen Innes Severn Local Government Area on the DECCW Wildlife Atlas

Introduction

Biodiversity can be defined as:

- the number and variety of organisms found within a specified geographic region, and
- the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Glen Innes Severn Local Government Area has many notable biodiversity features, such as World Heritage listed rainforests and being a stronghold for threatened species such as the Spotted tailed quoll (*Dasyurus maculatus*) and Powerful owl (*Ninox strenua*).

Photo 10: Glen Innes Severn Local Government Area is home to high levels of biodiversity and spectacular natural scenery (Photo: Malcolm Donnelly)

Pressure

The pressures, or human activities, that may impact on biodiversity in the Glen Innes Severn Local Government Area include feral animals, weeds, recreational activity, vegetation clearing, fire and climate change. The impacts of these activities can

include loss or fragmentation of habitat, decline in population of a species or damage to an ecological community, all of which lead to a decline in biodiversity. This is discussed in greater detail below.

Feral Animals

In Australia, pest animals have major economic, environmental and social impacts. Many pest animals cause significant damage to crops and seriously affect Australia's livestock industries by preying on stock and competing for pasture. Pest animals also cause severe land degradation by promoting soil erosion, stream turbidity and the spread of weeds. Competition, habitat destruction and predation by pest animals threaten the survival of many of Australia's native plants and animals (Department of Environment Water Heritage and the Arts 2009a).

Australian private and public landowners and users spend considerable time and money addressing the impacts of pest animals. For example, it has been estimated that eleven of Australia's major pest animals (wild populations of foxes, pigs, rabbits, mice, goats, carp, dogs, cane toads, camels, cats and horses) have negative impacts in Australia valued at over $720 million per annum (McLeod 2004).

The main feral animal species that affect biodiversity in the Glen Innes Severn Local Government Area include:

- Rabbits (*Oryctolagus cuniculus*) - Feral rabbits compete with native wildlife, damage vegetation and degrade the land. They ringbark trees and shrubs, and prevent regeneration by eating seeds and seedlings. Their impact often increases during drought and immediately after fire, when food is scarce and they eat whatever they can. Feral rabbits have contributed to the decline in numbers of many native plants and animals (Australian Government 2004a). Populations decrease to the east with only small isolated pockets existing in the National Parks.

- Goats (*Capra hircus*) - Feral goats have a major effect on native vegetation through soil damage and overgrazing of native herbs, grasses, shrubs and trees, which can cause erosion and prevent regeneration. They foul waterholes, and can introduce weeds through seeds carried in their dung. Particularly during droughts, feral goats can compete with native animals and domestic stock for food, water and shelter. Feral goats carry footrot, and it is difficult to cure sheep of this disease because they can become reinfected through contact with feral goat populations. They could also carry exotic diseases such as foot-and-mouth disease, should there be an outbreak in Australia (Australian Government 2004b). In Glen Innes Severn Local Government Area, only small isolated areas are infested with goats

- Deer (various species)- can destroy native plants, foul waterholes, cause soil erosion, transmit disease, spread weeds, destroy fences and cause car accidents.

- Pigs (*Sus scrofa*)- Feral pigs are environmental and agricultural pests. They cause damage to the environment through wallowing, rooting for food and selective feeding. They destroy habitat for native plants and animals and spread environmental weeds. Feral pigs destroy crops and pasture and they could spread exotic diseases should there be an outbreak (Australian Government 2004c). Feral pigs will eat anything from small animals to ground nesting birds, their eggs and chicks. They are responsible for the degradation of wetlands, cause erosion, disturb rainforest floors, dig up root systems and interfere with the regenerative cycle of native vegetation. Whilst pigs are

widespread throughout the Glen Innes Severn Local Government Area, large numbers or mobs are located in the more remote areas of the Local Government Area.

- Dogs (*Canis familiaris*) - some domestic dogs have "gone wild" killing sheep and calves, ground living birds, reptiles and native animals. Occurrences of these dogs are rare and occur mainly within the eastern side of the Shire.

- Cats (*Felis catus*) – Cats have probably contributed to the extinction of many small to medium sized mammals and ground-nesting birds. In some instances, feral cats have directly threatened the success of recovery programs for endangered species. Feral cats carry infectious diseases such as toxoplasmosis and sarcosporidiosis, which can be transmitted to native animals, domestic livestock and humans. If rabies were to be accidentally introduced into Australia, there is a high risk that feral cats would act as carriers of the disease (Australian Government 2004d). Feral cats are the most common killers of native wildlife and readily adapt to habitat conditions. They are known to kill and eat more than 100 species of Australian native birds, 50 mammals and reptiles, 3 frogs and numerous invertebrate animals.

- Foxes (*Vulpes vulpes*)– The fox has played a major role in the decline of ground-nesting birds, small to medium sized mammals and reptiles. It is thought to have caused a severe reduction in populations of many threatened species. The fox causes significant economic losses to farmers by preying on newborn lambs, goat kids and poultry. The fox could also act as a carrier of rabies, should the disease accidentally be introduced into Australia. Rabies mostly affects members of the dog family, but can also be passed on to humans, livestock and native mammals (Australian Government 2004e). Foxes are widespread throughout the Glen Innes Severn Local Government Area.

Weeds

Weeds pose a serious threat to human and animal health, to primary production and to our natural environment. Weeds reduce farm productivity, displace native species and contribute to on-going land degradation and reduced land values (Northern Inland Weeds Advisory Committee 2009).

The main weeds of concern in Glen Innes Severn Local Government Area are shown in Table 16.

Table 16: Weeds of Concern in Glen Innes Severn Local Government Area

Common Name	**Scientific Name**
St John's Wort	*Hypericum perforatum*
Serrated Tussock	*Nassella trichotoma*
Chilean Needle Grass	*Nassella neesiana*
Blackberry	*Rubus fruticosus (agg)* spp
Nodding Thistle	*Carduus nutans*
Privet	*Ligustrum lucidum, Ligustrum vulgare* *Ligustrum* sp.
Parthenium Weed	*Parthenium hysterophorus*

Recreational activity

Both hunting and fishing are popular activities within the Local Government Area. Most hunting comprises feral animals whilst the local fishing clubs have released

numerous young fish ensuring adequate fishing. Some fish species are protected and these include the Eastern Freshwater Cod. Recreational activity is restricted to camping within Crown Reserves such as the Mann River Reserve.

Fire

While the effects of bushfires are evident in most major vegetation types throughout Australia, the frequency and intensity of fires determine the floristic composition, structure and pattern of vegetation communities. Bushfires are important within the Glen Innes Severn Local Government Area as fire plays an important role in the ecology and thereby management of woodland communities through the stimulation of species regeneration (Aspect North 2005).

High intensity fire has historically been harmful to forest areas because of bark damage and retarding of growth. Common ignition sources for wild fires are escaped fires from burning off, re-ignition, lightning strikes, roadside carelessness and illegal fires. Another cause of high intensity fires is the build up of fuel on the forest floor. Without regular controlled burns or grazing activities allowed in the forest, the fuel load increases resulting in an ideal environment for a high intensity fire.

Vegetation clearing

Vegetation clearing is considered to be a key threatening process under the Threatened Species Conservation Act 1995 for many threatened plant and animal species and ecological communities in the Shire. Vegetation clearing reduces habitat for a high diversity of plant and animal species, and fragmentation of vegetated areas can also impact on the needs of wildlife with particular habitat requirements. According to the Glen Innes Severn Land Use Strategy:

> The coverage and connectivity of native vegetation is crucial to biodiversity conservation. Isolation and fragmentation leads to degradation and unsuitability of habitat and has been identified as a serious regional problem. It can also isolate populations, reduce the extent of local ecologically significant vegetation and reduce food supplies. A healthy network of native vegetation also lends itself to on-farm benefits and natural landscapes... To ensure that the ecosystems of the area continue to contribute to the environment in a positive way, biodiversity should be maintained and enhanced.

Source: Glen Innes Severn Land Use Strategy (GHD 2009 p. 36)

Climate change

Using predictions from the CSIRO (2007) reports on climate change in the Border Rivers-Gwydir and Northern Rivers catchments, it is likely that the future climate of the Glen Innes Severn Shire will be warmer and drier than its current state. Such trends would also increase evaporation, heat waves, extreme winds and fire risk. Despite this trend toward drier conditions, there is also potential for increases in extreme rainfall events (CSIRO 2007).

The report states:

> Although average changes in temperature, rainfall and evaporation will have long-term consequences for the catchment, the impacts of climate change are more likely to be felt through extreme weather events. Projections suggest there will be more hot days, bushfires, droughts and intense storms. These can all place human life, property and natural ecosystems at increased risk.
>
> Source: (CSIRO 2007)

Changes to the climate will have significant effects on biodiversity. An ecosystem that may be particularly impacted is the upland wetlands of the Tablelands. Although current threats to the catchment's biodiversity are largely a product of land clearing, historical alterations of river flows and water abstraction, climate change is likely to

further heighten the need for conservation efforts. The geographic distribution of a species is often defined by its 'climate envelope,' reflecting species-specific tolerances to extremes of heighten temperature and moisture. Climate change is likely to drive changes in the distribution of some plant and animal species, driving some species out of the Shire or enabling invaders to move in. Meanwhile, even those species capable of coping with climate change alone may succumb to the cumulative effects of multiple stressors. Despite such impacts, little is actually known regarding how climate change may affect some of the catchment's iconic species such as the Regent Honeyeater (CSIRO 2007).

According to CSIRO (2007), other risks to biodiversity in the Glen Innes Severn Local Government Area may include:

• Reductions in flows of streams within the catchment are likely to have a negative impact on aquatic biodiversity and wetland ecosystems.

• Plants and animals may become 'stranded' in isolated remnants of vegetation due to changing climate and continued development within the catchment.

• More frequent droughts and fires are likely to increase stress on plants and animals.

The Department of Environment Climate Change and Water (2008a) stated further that climate change is likely to place additional pressures on those ecological communities that are already stressed due to fragmentation and may be less resilient to disturbances. Specialised communities with a limited distribution may be at risk of degradation or loss. Fauna are likely to be affected by habitat loss, long hot spells and reduction in hey habitat resources such as hollow bearing trees and nectar. An increase in fire frequencies will probably lead to widespread changes across many ecosystems.

State

'State' in this context refers to the current state or condition of the biodiversity in Glen Innes Severn Local Government Area. State can potentially be measured through indicators such as area of native vegetation cleared per year (measured by area of vegetation cleared (in hectares) reported through Property Vegetation Plans notified to Council from Northern Rivers Catchment Management Authority and Border Rivers Gwydir Catchment Management Authority), areas known to have been revegetated (measured by area of land revegetated (in hectares) as reported through Catchment Management Authorities and Land Care), extent of protected areas (measured by area of land protected for nature conservation (in hectares)), level of community concern regarding biodiversity (measured by number of calls received by Environment Line), actions taken to improve the conservation of specific species of flora and fauna listed under the Threatened Species Conservation Act and other legislation (measured by the number of actions listed through Threatened Species Recovery Plans), actions taken to minimise the impact or reverse the spread of species of weeds (measured by the number of weeds targeted) and actions taken to minimise the impact or reverse the spread of species of feral animals (measured be the number of feral animals targeted). Each of these potential indicators and the state of biodiversity are discussed below.

Remnant vegetation

Seven major vegetation types have been identified in the Glen Innes Severn Council. They are rainforest, moist open forest, dry open forest, woodland, plateau sclerophyll complex, disturbed remnant vegetation and plantation forest (National Parks & Wildlife Service 1989 in Glen Innes Severn Council 2006). The Glen Innes Severn Council State of the Environment Report 2006 describes these vegetation types in detail, so that information will not be repeated in this report.

Vegetation clearing

Proposals to clear vegetation on rural and rural residential zoned land are dealt with through the Native Vegetation Act 2003, administered in the Glen Innes Severn Local Government Area by the Border Rivers Gwydir Catchment Management Authority and Northern Rivers Catchment Management Authority. DECCW provides a public register of approved Property Vegetation Plans, however this register does not provide information on the local government area in which the clearing occurred. This makes it difficult to determine the area of vegetation that is cleared annually. For this reason, vegetation clearing will not be used as an indicator for this State of the Environment report.

Proposals to clear vegetation on urban zoned land are dealt with by Council. During 2007/08 and 2008/09, Council received no applications to clear remnant vegetation through the development assessment process.

Revegetation

The area of land planted out for native vegetation provides an insight into the rehabilitation of habitat and promotion of biodiversity in the Local Government Area. During 2005/06, 18 hectares in the Glen Innes Severn Local Government Area were revegetated. During 2006/07, 6 hectares were revegetated. During 2007/08, 12 hectares were revegetated. These projects were funded through the Border Rivers Gwydir and Northern Rivers Catchment Management Authorities.

Species Diversity

Previous State of the Environment Reports have not recorded the number of species found within the Local Government Area but this can be a useful indicator of community knowledge and interest in flora and fauna as the DECCW Wildlife Alas Database lists those species found in the area based on community and scientific records. Therefore it is recommended that numbers of species are used as an indicator for this and future State of the Environment reports.

A search of the DECCW Wildlife Atlas Database for all species recorded within the Local Government Area revealed 1,846 flora species with 16,972 records have been documented along with 415 fauna species with 14,317 records (DECCW 2009a).

Threatened Species

Similarly, results listed on the DECCW Wildlife Atlas Database for species listed under the Threatened Species Conservation Act 1995 can give an indication of community concern and interest in these species.

A search of the database revealed 32 threatened flora species have been recorded within Glen Innes Severn Local Government Area. These species were represented by 182 records.

Fifty-six threatened fauna species have been recorded in the same area. A total of 1616 records of these species were found (DECCW 2009a).

Note that the Wildlife Atlas is dependent on community surveys and the increase in records of species and threatened species may be more a reflection of survey effort than the actual distribution or populations of these species.

In 2009, the Federal Government Environment Protection and Biodiversity Conservation database revealed 104 species and 2 endangered ecological communities listed in the region, for which Conservation Advices exist (Australian Government 2009).

An indicator of action on threatened species management is the number of actions taken to improve the conservation of threatened species in the Glen Innes Severn Local Government Area. No Recovery Actions or Threat Abatement Plans are currently listed for the Glen Innes Severn Local Government Area (DECCW 2009b).

Protected Area Estate
As discussed in the Land section, from 2005 to 2009 the area of land in Glen Innes Severn Local Government Area that is managed as protected area increased from 107,393 hectares to 107,507 hectares. This is an increase in area of 114 hectares. This increase is relatively modest in comparison to previous years, where the protected area estate increased significantly. Protected areas can be strongholds for biodiversity, threatened species and threatened ecosystems. In Glen Innes Severn Local Government Area, threatened species such as the Spotted tailed quoll (*Dasyurus maculatus*) and Hastings River mouse (*Pseudomys oralis*) have strong populations within the protected areas.

Weeds
The most problematic weeds in the Shire include those listed in Table 15. Weeds targeted by Council during 2008/09 include the seven species listed in Table 15, which are discussed further in the Response section.

Feral animals
Feral animals are a constant threat to biodiversity, as discussed in the pressure section. Government programs related to this issue, which can be used as an indicator, are discussed in the response section.

Community concern over biodiversity issues
The level of community concern regarding biodiversity can provide a measurable indicator of the state of biodiversity in the Glen Innes Severn Local Government Area.

Community consultation for the Glen Innes Severn Council State of the Environment Report 2005-09
During community consultation for this State of the Environment report, the following issues relevant to biodiversity were raised by the community:

- Residents need help with wildlife management in urban areas, such as possums
- Fox problems are getting worse- the fox distribution is expanding, possibly due to decrease in sheep grazing and baiting programs
- Rabbit problems are very bad- the worst they have been in 30 years
- A new invasive species committee has been established for the region- to develop an integrated pest management plan, looking at controlling many pest species. Landholders will be asked to complete surveys considering the level of impact of invasive species on primary production and the environment. This aims to make pest management specific to the needs of landholders. The invasive species plan is due for completion Jan 2010.
- Council's Noxious weeds officer needs to ensure community education occurs
- Council's Open Space planning document needs to ensure it includes a vision for the use of parks (developed by park users)
- Habitat for wildlife in urban areas is important- even weeds (e.g. Hawthorn) in some cases- and this needs to be taken into account in managing open space. Loss of habitat is a big issue

- Park maintenance is being done well
- A tree management policy for town area is needed/needs to be improved- trees need to be preserved

Wildlife habitat corridors

Wildlife habitat corridors are an important factor in determining the level of biodiversity in an area as they provide shelter and a corridor, which allow the movement of wildlife between other nodes and islands of habitat to occur. Wildlife corridors also provide refuges for rare species, seed sources for revegetation programs under Greening Australia, educational resources for school environmental studies and a baseline for ecological studies. Koalas have been known to travel in excess of 30km via these routes. Koalas have been recorded at numerous locations in the Shire. These areas include Rummery's Hill, Mount Mitchell, Dundee Estate, The Gulf, Emmaville and Kingsland (Pam Wilson *pers. comm.*).

The most useful wildlife habitat corridors in the Glen Innes Severn Local Government Area are roads, reserves and Travelling Stock Routes. Over 50,000 hectares of land within the Local Government Area is managed as Travelling Stock Routes. In a report from the Armidale Branch of the National Parks Association of NSW Inc, it is recommended that all vegetated TSRs and road reserves are listed as environmentally sensitive areas due to their value as a wildlife corridor. They also have unique vegetation features, contain unique landscapes as well as providing a refuge for threatened fauna and flora species. Council manages the roads and reserves, while the Livestock Health and Pest Authority manages Travelling Stock Routes.

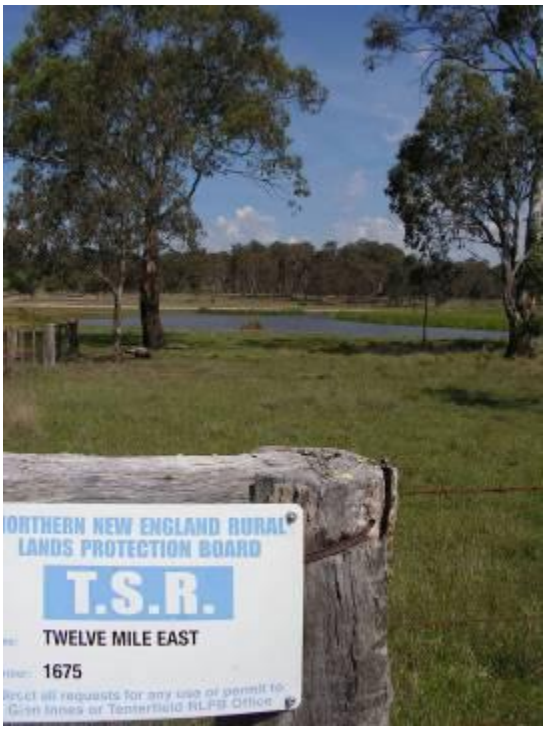


Photo 11: Travelling Stock Route

The major threats to the wildlife habitat corridors in the Glen Innes Severn Council are the uncontrolled dumping of rubbish, the removal of trees for firewood and fencepost, uncontrolled fire regimes and the unnecessary destruction of trees for road construction purposes. Uncontrolled firewood collection and the felling of trees for firewood and fencepost are a particular threat to the Mugga Ironbark (*Eucalyptus*

sideroxylon). This tree species is important habitat for the endangered Regent Honeyeater (*Xanthomyza phyrygia*). Remnant areas of Mugga Ironbark have been shown to be a key resource for the Regent Honeyeater. Thus if the felling of Mugga Ironbarks is not monitored and controlled, the Regent Honeyeater could be pushed towards extinction (Glen Innes Severn Council 2006).

High sensitivity habitat
There are many natural wetlands present within Council's area, which are characteristic of the granite geology of the Northern Tablelands. These areas are environmentally sensitive, as they provide a specific habitat for a selected niche of floral and faunal species. For example, Barleyfields Lagoon at Glencoe and Blair Hill Lagoon on the eastern side of Council's area are considered important habitats for both local and migratory bird species.

Disturbances, such as the prolonged holding of water in wetland areas can disrupt the natural wetting and drying cycle, therefore reducing the productivity of the wetlands. Some floral species (e.g. Redgum) cannot tolerate the permanent exposure to water; therefore the floristic composition of the wetland is reduced (Catchment Management Issues in the Macintyre River Catchment, 1991 in Glen Innes Severn Council 2006).

Response

Glen Innes Severn Land Use Strategy Draft Strategic Plan 2007
This draft plan provides a number of recommendations to conserve biodiversity, including:

- Recognise the biodiversity and conservation values of the Shire
- Integrate the protection of biodiversity and ecosystem processes into development and planning policies and process
- Increase the viability of areas of biological significance by identifying and protecting them and creating linkages between them
- Increase community awareness and involvement in identifying, protecting and enhancing biodiversity.
- Implement biodiversity plantings in the Wellingrove area to establish linkage corridor between natural forest areas
- Undertake environmental weed control along roadsides through the RVIP program.

This Strategic Plan also includes planning mechanisms to avoid development in bushfire prone areas.

Recovery Plans
There are currently no recovery plans for threatened species implemented in the Glen Innes Severn Council area.

Fire Management
Glen Innes Severn Council has an emergency services representative on the Bushfire management Committee and a Councillor who chairs the Committee. This Committee coordinates general fire hazard reduction across agencies. Council undertakes roadside slashing to reduce fire hazard. Council does not currently have a fire policy.

Weeds

Council has a delegated Noxious Weeds Officer who works to develop strategies to manage weeds and ensures compliance under the Noxious Weeds Act 1993 in the Shire. Council has developed a Noxious Weeds Policy and operates under the Northern Inland Weeds Advisory Committee Noxious Weeds Advisory Strategy and Regional Noxious Weeds Plans. These strategies and plans are updated annually to keep pace with emerging weed trends.

Council implemented a number of successful weed management strategies, which included control of English broom (*Cytisus scoparius*), Paterson's curse (*Echium plantagineum*), Longstyle feather grass (*Pennisetum villosum*), Blackberry (*Rubus fruticosus*) and Briar (*Rosa rubiginosa*).

Using funding from the RVIP program, Council is implementing an environmental weeds project which focussed on managing Firethorn (*Pyracantha* spp.), Cotoneaster (*Cotoneaster* spp.) and wild fruit trees.

Community awareness materials were distributed in the form of the *Priority Noxious Weeds of Glen Innes* booklet and the *Namoi Gwydir New England Noxious Weed Control Handbook*.

Weeds on Council land (including road reserves, protected areas etc) were controlled through Council's contract weed sprayer. Council also received grants from the Land and Property Management Authority to manage weeds on Crown land.

Slashing on road reserves is undertaken by Council and training is currently being developed for best practice management procedures such as preventing the spread of weeds on machinery and identification of weed hotspots.

The highest priority weed that Council managed in 2012/2013 was Serrated Tussock. Council is attempting to contain this weed on roadsides and prevent its spread. Control measures, such as herbicide and pasture management are effective for this weed.

St John's Wort is also a high priority which is being contained on private property.

Council assists community members by asking them to bring in weed specimens for identification and management advice.

National Parks and Wildlife also actively control weed species on protected areas (which make up a significant area of the Local Government Area). Priority weeds that NPWS manage include lantana (*Lantana sp.*), perennial grasses (such as Coolatai grass (*Hyparrhenia hirta*), African love grass (*Eragrostis curvula*) and Whisky grass (*Andropogon viginicus*)), blackberry, Crofton weed (*Ageratina adenophora*) and honey locust (*Gleditsia tricanthos*).

The Livestock Health and Pest Authority manages weeds on its 50,000 hectare Travelling Stock Route estate and cooperates with Council to coordinate management programs.

Feral Animals

The management of feral animals mostly falls under the jurisdiction of the Livestock Health and Pest Authority. This authority undertakes awareness and feral animal management programs for priority pests in the Local Government Area. Baiting programs for foxes are undertaken during winter. Rabbits, which appear to be getting worse in recent years, are a significant pest that is controlled through 1080 baiting programs and ripping. An annual wild dog control program has been running for 25

years. Pigs are controlled in strategic areas of NSW (Frizell P. 2009 *pers. comm.* 26th Oct).

During, 2012/2013, no notices were issued for feral animal breaches in the Shire. The Livestock Health and Pest Authority undertook aerial baiting programs for wild dogs and ground baiting programs for foxes.

Deer (including red deer and fallow deer) are considered to be an increasing threat due to an increase in numbers and distribution. These animals cause problems by eating livestock feed, destroying fences and causing car accidents.

The wild dog problem is getting worse as the population is moving further west. Rabbits are also considered to be causing real problems in the Shire.

Feral animal control programs have improved through the increased participation of landholders in the Shire and it is hoped that this trend will continue. (Rob Munroe, *pers. comm.*)

Council deals with roaming domestic dogs which is a time consuming role for the Council compliance team.

National Parks and Wildlife actively manage feral animals on their estate, targeting foxes, wild dogs, pigs, goats and deer.

Climate Change
There is currently no policy or identified program to deal with the impacts of climate change on biodiversity in Glen Innes Severn Shire.

Vegetation Clearing
Proposals to clear vegetation on rural and rural residential zoned land are dealt with through the Native Vegetation Act 2003, administered by the Border Rivers Gwydir and Northern Rivers Catchment Management Authorities. This legislation is under review with draft legislation to come into force from 1 January 2014.

Proposals to clear vegetation on urban zoned land is dealt with by Council. During 2012/2013, Council received no applications to clear remnant vegetation through the development assessment process.

Glen Innes Natural Resources Advisory Committee (GLENRAC)
During 2012/2013 GLENRAC undertook the following projects/field days related to biodiversity conservation:

- Mynor bird capture and humane disposal
- Compost trial field day
- Glen Innes Severn Council newsletter sponsorship- Weeds
- Northern Rivers Land networks- Small Farms and Biodiversity Workshops
- Private Native Forestry Information Evening with 30 participants
- Spotted Tailed Quoll Field Day with 30 participants
- Biodiversity Workshop.

During 2012/2013, GLENRAC undertook the following projects related to biodiversity conservation:

- Funding secured for weed control at Wytaliba (honey locust) Area 20ha
- World Wildlife Fund 'Raising Awareness of Spotted-tailed quolls in the Glen Innes District'
- Tree Planting Preparation Field Day
- Native Plants Identification Field Trip
- Farm Trees Field Day
- Private Native Forestry Information Evening
- Spotted Tailed Quoll Field Day.

Border Rivers Gwydir Catchment Management Authority (BRGCMA)
Since its inception, the BRGCMA has implemented a number of projects in response to biodiversity conservation, with the following management targets:

- B1 – Manage for conservation: 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 EPBC Act.
- B2 – Additional native vegetation: By 2015 re-establish an additional 5,000 hectares of native vegetation in the catchment through replanting and or natural regeneration with a priority given to improving the condition of remnant native vegetation within priority sub-catchments.
- B3 – Weeds and feral pests: By 2015, land managers have implemented management practices that reduce weeds and feral pests on 25,000 hectares.

Northern Rivers Catchment Management Authority (NRCMA)
The Northern Rivers Catchment Management Authority has implemented a number of projects to promote biodiversity conservation within the Shire, with the objective that by 2016, there will be an improvement in the condition of native terrestrial and aquatic ecosystems. These projects include:

Roadside Management Guide

Photos 12 and 13: High conservation areas adjoining roads in Glen Innes Severn Local Government Area

The Roadside Management Guide for the Shire aims to 'show how a balance can be achieved between maintaining road safety and services, and preservation of the roadside environment'. This guide identifies roadside areas of high conservation values and provides recommendations for the management of these areas. This guide is used by Council staff and external parties such as utilities companies.

Tree Removal Policy- Council Land

Council uses this policy to assess the requirement for full or partial removal of trees on Council land, taking into account the risks and benefits associated with various options. This policy was renewed in 2010.

There are been some tree vandalism issues in the Local Government Area.

Glen Innes Severn Council Recreation and Open Spaces Management Plan

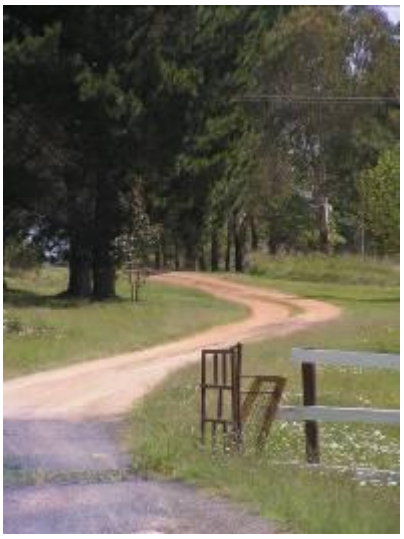


Photo 14: One of the many recreational open spaces found in Glen Innes Severn Local Government Area

Council's objective through this plan is to provide, maintain and enhance public open space areas for active and passive recreation to enhance the lifestyles of residents and visitors alike. The Recreation and Open Spaces Management Plan guides the planning, development and management of the Open Space Network within Glen Innes Severn Local Government Area.

Travelling Stock Routes

Travelling Stock Routes can be important wildlife corridors and often contain areas of high conservation value. Council manages the roads and reserves, while the Live Health and Pest Authority manages Travelling Stock Routes.

High conservation value areas in Travelling Stock Routes are not currently documented, but the Livestock Health and Pest Authority manage these areas for grazing and aim to balance their use between grazing and conservation. Where possible, usually through grant funding, high conservation value areas are fenced off and protected. Management is often a collaborative effort with groups such as Greening Australia and bird watching groups (McLeod M. and P. Frizell 2009 *pers. comm.* 23rd and 26th Oct).

SEPPs

State Environmental Planning Policies (SEPPs) are a planning instrument used to control and restrict some development in the Shire. The major SEPP affecting biodiversity is SEPP 44 Koala Habitat.

Conclusions

Glen Innes Severn Local Government Area is fortunate to be home to high levels of biodiversity, a large proportion of endemic species and threatened species that are no longer found in other areas of Australia. It is also fortunate to have a number of government agencies that work cooperatively together for the benefit of the environment and Land care groups and community members who contribute significantly towards the conservation of biodiversity.

The indicators for the biodiversity sector show that community concern and possibly interest in biodiversity is increasing. Natural resource management programs such as revegetation programs have fluctuated over the years in accordance with funding available and prioritisation of work undertaken. A continued, constant investment in revegetation and biodiversity projects would benefit the biodiversity of Glen Innes Severn Local Government Area.

In order to protect biodiversity, Council planning documents such as the Draft Land Use Strategy and the proposed new Local Environment Plan should be developed, approved and accepted by Council expeditiously so that the control measures for biodiversity within these can be implemented.

Council currently has no climate change policy. Funding is available through groups such as the Federal Government Department of Climate Change, for example the Local Adaptation Pathways Program which provides funds to help Councils to undertake climate change risk assessments and develop action plans to prepare for the likely local impacts of climate change. It is recommended that Glen Innes Severn Council investigate funding assistance and consider developing a climate change policy for the Local Government Area.

Continuation of Council's noxious weeds and the Livestock Health and Pest Authorities feral animals programs are recommended. These programs contribute to reducing the impact of these significant threats to biodiversity and production in the Glen Innes Severn Local Government Area.

High Conservation Value areas, such as those located on Travelling Stock Routes are currently not well documented. It is recommended that these areas be documented so that the management can be customised to meet the requirements of these sensitive ecosystems.

The Glen Innes Severn Local Government Area community may benefit from further education of the biodiversity values found within its surrounds. Council could develop some educational tools to inform the community of local biodiversity and threatened species, including those in urban and rural areas.

WASTE

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the waste sector is presented in Tables 17, 18 and 19. These issues are discussed further under the ensuing headings.

Table 17: Summary of Pressures, States and Responses for the Waste Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Waste generation Waste disposal Hazardous waste	Total waste disposed Capacity of waste landfill sites Waste recycled	Landfill management Landfill expansion Recycling Green waste management Northern Inland Regional Waste Initiatives Illegal dumping compliance Drum Muster Waste Into Art

Table 18: Summary of Potential Indicators for the Waste Sector

Potential Indicator	**Potential Measurement**
Total Waste Disposed	Waste generated per head of population per year (kilograms per person per year)
Total Waste Recycled	Volume of recyclable materials recycled (tonnes or metres^3)
Capacity of Waste Landfill Sites	Life expectancy of landfill sites (years)
Level of community concern regarding waste	Number of calls received by Environment Line regarding waste

Table 19: Indicator Values 2005 – 2009 for the Waste Sector

Introduction

New South Wales has a growing population and a healthy economy that is producing more goods and services. Waste generation is increasing under these conditions, and actions taken to reduce waste generation can lead to enhanced conservation of our natural resources and a reduction in environmental harm from waste management and disposal of solid waste. Furthermore, waste reduction and recycling can avoid greenhouse gas, save water and energy, conserve virgin resources and improve the health of our soils (Department of Environment Climate Change and Water 2007).

Glen Innes Severn Council is the primary provider of waste collection and disposal services in the Local Government Area. Glen Innes Severn Council currently operates four waste disposal sites across the Local Government Area. These disposal sites accept only solid waste and physically or chemically fixed, treated or processed waste. The increasing quantity and complexity of waste needs careful planning in the Glen Innes Severn Local Government Area. To minimise environmental impact and to safeguard public health and safety the storage, collection, transport and disposal of waste requires high standards. The overall reduction of waste is also essential for the Local Government Area, where waste treatment and disposal should be viewed as the least preferred methods of waste management (GHD 2009).

Pressure

The pressures, or human activities, that may impact on waste in the Glen Innes Severn Local Government Area include waste generation, inappropriate waste disposal and hazardous waste. These pressures are discussed in greater detail below.

Waste Generation

Waste generation has escalated in recent years due to the increasing purchasing and consuming capacity of Australian society. Between 2001 and 2004, the amount of productive land and water needed to produce the resources we consume and absorb the resulting wastes increased from about 1.8 to 7.7 hectares per person (Australian Academy of Science quoted in Solutions-in-Store (2007)). Within Glen Innes Severn Local Government Area, there is a need to reduce the volume of waste generated per person and disposed of to landfill.

Inappropriate waste disposal

Illegal dumping of waste in bushland areas or Travelling Stock Routes causes problems such as litter, land and water contamination and the spread of weeds.

Unsupervised waste dumping in Council landfill sites can cause problems through the mixing of inappropriate waste types (e.g. mixing recyclable materials with general waste). The illegal lighting of fires to burn waste at landfill sites by dump users is also a hazard.

An increase in recycling options, where economically viable and sustainable, could improve waste disposal.

Hazardous Waste

The disposal of hazardous waste from a number of sources creates pressure on the environment through contamination of landfill sites. The primary source of potentially hazardous waste in the Shire is agricultural chemicals and chemical containers.

State

'State' in this context refers to the current state or condition of waste in Glen Innes Severn Local Government Area. State can potentially be measured through indicators such as total waste disposed (measured by waste generated per head of population per year (kilograms per person per year)), capacity of waste landfill sites (measured by life expectancy of landfill sites (years)) and level of community concern regarding waste (measured by number of calls received by Environment Line regarding waste). Each of these potential indicators and the state of waste are discussed below.

Waste Disposal Sites

The Council currently operates four waste management sites. The Glen Innes Waste Management Depot is licensed under the POEO Act, whilst landfills at Emmaville, Deepwater and Red Range do not require POEO licences. The Glen Innes Waste Management Depot processes general waste as well as recycling waste at its Material Recovery Facility, and separates and mulches green waste.

The Glen Innes Waste Management Depot is approaching its capacity, although a life expectancy for the landfill has not been documented. A feasibility study was undertaken in October 2008 to consider the option of extending the Glen Innes Waste Management Depot into the adjoining quarry (Environmental Earth Services 2008).

Capacities or life expectancies for the Emmaville, Deepwater and Red Range landfills are not documented.

Total Waste Disposed

General waste volumes for 2009-2013 were not available at the time of writing the report and therefore will not be used as an indicator.

Glen Innes Landfill was found to be fully compliant with the requirements of its landfill licence for 2012/2013.

Waste Recycled

Table 20 reveals the following trends for waste recycling in Glen Innes Severn Local Government Area:

- Paper recycling has increased
- Glass, plastic and scrap metal recycling has remained at about the same level
- Vehicle battery recycling has decreased
- Aluminium recycling has increased slightly
- Garden organics and vegetation have increased significantly

Community waste issues
DECCW received no calls to the Environment Line regarding waste issues during 2009-2013. This indicates that the community has a low level of concern regarding waste issues in the Glen Innes Severn Local Government Area.

Community consultation for the Glen Innes Severn Council State of the Environment Report 2005-09
During community consultation for this State of the Environment report, the following issues relevant to waste were raised by the community:

- The community needs education to manage its own waste- e.g. mulching green waste rather than sending it to the green waste facility at the tip
- We need to look at sources of waste and try to reduce these.

Response

Glen Innes Severn Council Land Use Strategy
The Glen Innes Severn Council Land Use Strategy provides a number of recommendations regarding waste management, which can be summarised under the following headings:

- Minimise waste through a range of approaches including avoidance, reduction, recycling, re-use and recovery of materials
- Ensure that landfills are appropriately sited and managed to minimise harm to the environment, public health and community values
- Manage industrial, commercial and household waste
- Achieve commitment and involvement of government, industry and the community in improving waste management practices (GHD 2009).

Landfill Management
At the Glen Innes landfill leachate and settlement ponds that have been in place for some time collect all stormwater runoff and leachate and the final effluent pond is pumped back and sprayed over an old rubbish disposal area that has been capped, levelled and vegetated. The effluent is taken up by the vegetation and evaporation. Any excess finds its way back to the effluent ponds. The Ponds are continually emptied to cope with the additional rains. The ponds run sprinklers on the grassed paddocks above the ponds. Except in very exceptional circumstances no waters are released into the river systems. Glen Innes Landfill was found to be fully compliant with the requirements of its landfill licence for 2007/08 (CodyHart Environmental 2008).

The use of the garbage landfill compactor has helped in the control of garbage and windblown paper. A fence to prevent windblown paper from escaping the depot was erected in the 1998/99 year.

A wash bay was installed in 2007/08 to allow the cleaning of machinery, prevent the spread of weeds and to manage the effluent water. Sediment and erosion measures are also used on site.

To facilitate appropriate landfill management Emmaville, Red Range and Deepwater landfills have restricted opening hours and are supervised during times that they are open to the public.

Landfill Capacity

As the Glen Innes Waste Management Depot is approaching its capacity, a feasibility study was undertaken in October 2008 to consider the following options for increasing the capacity of the Waste Management Depot:

- Extension of the Glen Innes Waste Management Depot into the adjoining quarry
- A completely new green field site
- Alternate waste treatment technology on the existing site, and /or
- Transfer to another site outside the local government area.

Recycling

Recycled materials are collected on behalf of Council by Glen Industries who also manage the Material Recovery Facility at the entrance to the Glen Innes Waste Management Depot. Council constructed the materials recovery facility in June 1995 and since then the recycling effort by the community has increased. From 1996 to 2008, the total quantity of materials that have been recycled has increased from 450.3 tonnes to 1461.34 tonnes, which is a 324% increase in recycling effort Melaleuca Enterprises 2008)

Materials recycled include paper, glass, plastic, aluminium, garden organics/vegetation, scrap metal, construction and demolition waste, steel and vehicle batteries. More than 5200 litres of oil has been recycled and countless numbers of tyres sent for recycling.

Green Waste

Currently green waste is separated and mulched. A complete cover of mulch is placed weekly on the compacted landfill to act as a cap. Council is a member of the Northern Tableland Waste Management Group and various methods of handling green waste are being addressed in an effort to utilise a cost effective regional method. The use of green waste as a capping material in landfill has the potential to passively oxidise methane within the landfill cap as it passes through a biologically active, oxygen rich layer of green waste. This is currently being viewed as significant in reducing greenhouse gas emissions (Glen Innes Severn Council 2009c).

In 2009, Council undertook a review of green waste management and identified the following issues:

- The existing method of green waste management is the most efficient system available to Council at this point in time
- Council's existing landfill charges are significantly less than other Councils in the region
- Council is not meeting the true cost of landfill, particularly in regard to achieving adequate financial reserves for rehabilitation and new landfill under the current waste funding and charging arrangements
- A review of landfill charges is required, and
- The promotion of waste diversion from landfill is required through the promotion of mulching, composting and recycling of waste.

In response to these issues, Council resolved that:

- That Council continue the current practice of mulching green waste and utilising it as a cover material in the landfill with surplus material sold to the public.
- That a full review of landfill charges be undertaken in conjunction with the 2010-2013 Management Plan. This was undertaken.
- That the community be encouraged to minimise the amount of waste generated to landfill by using composting , mulching and recycling and that this be promoted by:
    - Handing out of appropriate brochures at the landfill
    - Articles in Council's quarterly newsletter, and
    - A monthly section in Connecting with Your Council (Glen Innes Severn Council 2009c).

Northern Inland Regional Waste Initiatives
Council participates in a number of Northern Inland Regional Waste initiatives including metal collection, green waste processing and an annual chemical collection.

Waste strategies include the following actions to better manage the waste stream at landfill sites:-

- Control access to landfill sites and manning gates.
- Drop off centres at landfill sites for recyclable materials.
- Segregation of waste stream at landfill site, materials such as green waste, metals and building materials, concrete and tyres etc. Reduction of waste to landfill.
- Groundwater monitoring – piezometer at Red Range site.
- Waste collection services to villages of Emmaville, Deepwater and Glencoe. Extensions of services will be considered by Council as the need arises for other village or rural residential areas close to current service centres.
- Reduction in hazardous materials and fires in sites due to controlled manning of sites.
- Removal of hazardous chemicals and containers from the waste stream through the continued support of the Chemical collection and Drum Muster programs.
- No waste is burned.
- All old waste sites have been capped and remediated. Appropriate sites are then rented out for grazing.
- Ongoing education to assist with reduction of litter and general waste problems within the broader community.

Illegal Dumping
In 2012/2013, Council's compliance team dealt with 3 cases of illegal dumping. The perpetrators were not identified.

Litter
Litter is not considered to be an obvious problem in the Shire. Some littering occurs in the Glen Innes township late at night however it is difficult to enforce compliance on this issue.

Chemical Collection
The Annual Northern Inland Regional Waste Chemical Collection Campaign has been in operation for a number of years and has been gauged an immense success in minimizing environmental and health risks for the region. This program is conducted in July/August of each year.

The program is conducted for unwanted farm and household chemicals. This is an annual campaign and there are various collection sites within the NIRW Member Council region.

The program is aimed at reducing the risk of accidental poisoning and the inappropriate disposal of chemicals within the environment.

DrumMUSTER
The Council participates in the DrumMUSTER program, which offers a service for the collection of empty, cleaned and non-returnable agricultural chemical drums. To date, nearly 14 million drums have been collected throughout Australia.

Waste into Art
This unique art competition and exhibition was open to all residents and was a Northern Inland Waste initiative. It celebrated the reuse and recycling of waste in the community through art, sculpture and graphic design.

Conclusions

It is difficult to draw strong conclusions due to lack of information regarding indicators, however Council has developed a strong recycling program over the last 13 years and continues to improve this system. Council has demonstrated progressive initiatives in dealing with waste generation and recycling.

Glen Innes Severn Local Government Area needs to expand its landfill capacity and this issue will need to be dealt with in coming years.

.

AIR

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the air sector is presented in Tables 21, 22 and 23. These issues are discussed further under the ensuing headings.

Table 21: Summary of Pressures, States and Responses for the Air Sector (note information across rows does not necessarily directly relate to each other)

Pressure	State	Response
Agriculture Mining Fire Transport Residential, commercial and industrial development	Licences to create air pollution Community air quality issues Pollutant emissions Vehicle use Dust pollution Smoke Green house gas emissions	Council delegations under the POEO Act NSW Government green house gas reduction incentives Fire management plans National Pollutant Inventory Efficient building design GLENRAC community education Glen Innes Severn Council Land Use Strategy

Table 21: Summary of Potential Indicators for the Air Sector

Potential Indicator	Potential Measurement
Number of Premises with POEO Air Licenses	Number of current licences with air conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act
RTA vehicle counts for the New England Highway	Number of Vehicles
National Pollutant Inventory emissions for Glen Innes Severn Local Government Area	Total emissions (kg/year) according to National Pollutant Inventory
Community concern regarding air issues	Number of air complaints reported to the DECCW Environment Line

Table 22: Indicator Values 2005 – 2009 for the Air Sector

Indicator (units)	2009/10	2010/11	2011/12	2012/13	Trend
Number of Premises with POEO Air	4	4	4	4	Stable

Licenses (Licence Holders)					
RTA vehicle counts (number vehicles)	?	?	?	?	Data not updated since 2004
Pollutant emissions (Total emissions in kg/year)	Refer Table 23	Refer Table 23	Refer Table 23	?	Constant for 6 substances, decreasing for 7 substances
Level of community concern regarding air (Complaints to DECCW)	1	0	1	0	Stable

Introduction

Australians consistently rank air pollution as a major environmental concern. The state of our air is an important factor in the quality of life in Australia. It affects the health of the community and directly influences the sustainability of our lifestyles and production methods.

Air pollution is commonly emitted from three sectors:

- Transport: Road transport emissions can impact on environment quality, urban amenity and human health.
- Residential: Residential and dispersed sources of pollution, such as heating with wood, back yard burning and domestic appliances, are small but numerous but can be significant sources of air pollutants.
- Industry: Emissions from larger industries can be significant sources of air pollution (Department of Environment Water Heritage and the Arts 2009b).

The air quality in the New England Tablelands is generally considered to be good. A relatively small and diffuse population and a lack of major pollution generating industries helps control the output of air pollution within the Local Government Area. A regular rainfall pattern throughout the Local Government Area is a positive contributing factor in removing particulates from the atmosphere and promoting vegetation cover and growth, reducing wind erosion and therefore dust generation (Aspect North 2005).

Whilst air pollution is not considered a significant problem within the Shire, there is now a broadly accepted recognition that the earth's atmosphere is gradually heating and that human activity is at least in part responsible for this phenomenon. As human activity in this regard has a cumulative effect, that actions of the residents of Glen Innes Severn Local Government Area are considered as having wider ramifications.

Pressure

The pressures, or human activities, that can cause air pollution in Glen Innes Severn Local Government Area include agriculture, mining, transport, residential development and burning. These pressures can lead to emissions of green house gases, vehicle emissions, smoke, dust, odours, spray drift of pesticides and herbicides and emissions of pollutants such as nitrogen and phosphorus, all of which impact on air quality.

State

The state, or condition, of air quality in Glen Innes Severn Local Government Area can be measured via a number of indicators. These indicators include the number of premises with POEO air licenses (measured as the number of current licences with air conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act), the number of vehicles travelling through Glen Innes Severn Local Government Area (measured by Road and Transport Authority vehicle counts for the New England Highway in Glen Innes), total pollutant emissions for Glen Innes Severn Local Government Area (measured by total emissions in kilograms/year according to National Pollutant Inventory) and community concern regarding air issues (measured by the number of air complaints reported to the DECCW Environment Line). Each of these indicators is discussed below.

Premises with POEO Licences including air quality conditions

During 2012/2013, the number of premises with POEO Air Quality Licenses (measured by the number of current licences with air quality conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act) in Glen Innes Severn Local Government Area was four. As these licences have been in place since before 2005, it can be assumed that this indicator has stayed constant with four premises holding licences throughout this period.

Pollutant emissions

The Australian Government collects air quality data through the National Pollutant Inventory. State of the Environment reporting period, data is available. This information is summarised in Table 23.

There were 13 substances recorded as being emitted in Glen Innes Severn Local Government Area during this period. Some substances were emitted at a constant level throughout the period, such as Ammonia, Carbon dioxide, Oxides of Nitrogen, particulate matter, Sulfur dioxide and Cumene. Others appeared to decrease in the amount emitted during the reporting period, including Phosphorus, total volatile organic compounds, Benzene, Ethyl benzene, n-Hexane, Toluene and Xylenes.

The main sources of these substances (in order of quantity emitted) in Glen Innes Severn Local Government Area are sheep beef cattle and grain farming; mineral metal and chemical wholesaling; and water supply sewerage and drainage services (National Pollutant Inventory 2008).

Table 23: Total Emissions of Pollutants per Year 2009/2010-2011/2012

Substance	**2009/2010 Total Emissions (kg/year)**	**2010/11 Total Emissions (kg/year)**	**2011/12 Total Emissions (kg/year)**
Ammonia	2,300,000	2,700,000	2,500,000
Carbon monoxide	20,000	20,000	18,000

Oxides of Nitrogen	48,000	47,000	47,000
Phosphorus	3,600	0	0
Particulate Matter 10.0um	410,000	470,000	430,000
Sulfur dioxide	4,400	4,400	4,100
Total volatile organic compounds	13,000	7,200	4,000
Benzene	66	32	0
Cumene (1-methylethylbenzene)	0	4	0
Ethylbenzene	3.9	2	0
n-Hexane	120	41	0
Toluene (methylbenzene)	88	32	0
Xylenes (individual or mixed isomers)	17	9	0

Source: National Pollutant Inventory (2012)

Community Issues related to Air quality

DECCW received no calls to the Environment Line regarding air quality issues. This indicates that there is little community concern regarding air quality in Glen Innes Severn Local Government Area.

Community Consultation of the State of the Environment Report

During community consultation for this State of the Environment report in October 2009, community members raised the following issues in relation to air:

- Better public transport is needed and all facilities in town need to be within walking distance of each other- cycling and pedestrian network needs to be developed- for example, Bondi Council are using night soil laneways

- Glen Innes is chosen by people to live in due to its small size and accessibility (owning a car is not necessary)- need to ensure this is maintained.

Both of the above issues will benefit air quality by reducing vehicle emissions.

Dust Pollution

Dust is a particulate matter that forms through dry erosion (Aspect North 2005). Dust pollution from agricultural activity, development sites and unsealed roads is a recognised environmental nuisance in many rural communities. In the past, there have issues associated with dust generated from a quarry found in Glen Innes Severn Local Government Area.

Smoke

Air quality in the shire is affected by smoke from domestic solid fuel heaters during the colder autumn and winter months, April, May, June, July and August. Other sources of smoke include occasional rural burning off for weed and fire hazards in the rural and village areas and uncontrolled fires within Councils landfill sites. Fire Hazard reduction programs within State Forests and National Parks areas can cause some smoke pollution.

Green House Gas Emissions

Green house gases are mainly produced by the burning of fossil fuels, vehicle exhaust and methane production by livestock. No data is available to measure green house gas emissions within the Shire.

Response

Wood smoke
Wood smoke is not a major health concern in the Shire as smoke does not collect in residential areas. Council's compliance team regulate any domestic air pollution issues under the Protection of the Environment Operations Act 1997.

Fire
Glen Innes Severn Council has policies for the prevention and control of bush fires. The Severn Bush Fire Management Committee has in place a Bush Fire Management Plan and Fuel Management Plan.

Licensing and Monitoring
DECCW Licensing acknowledges that certain industries, important to the local economy, are potential generators of pollution. By licensing such activities regulatory authorities are able to control the output of pollutants and ensure the continued protection of the environment.

National Pollution Inventory
The Australian Government collects and analyses data from 90 substances considered to be pollutants. This information can be used to monitor the annual contribution of pollutants produced in Glen Innes Severn Local Government Area from point and diffuse sources.

Vehicular Traffic
Vehicular traffic along the New England Highway is beyond the control of the Council. However, Council can have an impact on vehicle use in towns through the provision of footpaths and bikeways, planning towns so that amenities are accessible via foot, bicycle or public transport, supporting an effective public transport system and encouraging alternative forms of transport to private vehicles.

GLENRAC
During 2006/07 GLENRAC held information seminars for the Glen Innes Severn community on climate change and bio fuels.

Green house gas emissions
Council does not have a climate change strategy in place.

New buildings are required to comply with BASIX and the Australian Building Code which sets the standard for energy efficiency, thereby minimising future green house gas emissions.

Glen Innes Severn Council Land Use Strategy
This Strategy takes into account the potential conflict created by air pollution when developing a strategy to plan the future development of the Glen Innes Severn Local Government Area. The following recommendations are made in relation to air:

- Minimise future air quality and noise related impacts:
    - Consider possible air and noise impacts during the development assessment process to ensure future developments are located appropriately and that appropriate controls and/or mitigating measures are conditioned.
    - Ensure appropriate controls are implemented to reduce the potential air and noise impacts from future developments.
- Implement strategies to minimise air and noise related impacts, including

- Develop a register of noise complaints so that continual breaches can be identified and penalised if necessary.
- Enforce and monitor implementation of noise and air controls.
- Educate residents on how to minimise air pollution by the appropriate use of wood heaters.
- Educate residents on the impacts associated with air and noise pollution (GHD 2009).

Conclusions

Most indicators for the air sector remained relatively stable during the reporting period. This is good news for the air quality of Glen Innes Severn Local Government Area.

Climate change is becoming an increasingly urgent issue that needs to be addressed, and Council should consider doing this with assistance from agencies such as the Commonwealth Government Department of Climate Change.

NOISE

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the noise sector is presented in Tables 24, 25 and 26. These issues are discussed further under the ensuing headings.

Table 24: Summary of Pressures, States and Responses for the Noise Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Agriculture Mining Forestry Transport Residential, commercial and industrial development Waste management	Licences to create noise Community noise issues	Development conditions State legislation Glen Innes Severn Council Land Use Strategy

Table 25: Summary of Potential Indicators for the Noise Sector

Potential Indicator	**Potential Measurement**
Number of Premises with POEO Noise Licenses	Number of current licences with noise conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act
Level of community concern regarding noise	Number of noise complaints reported to Council and the DECCW Environment Line

Table 26: Indicator Values 2005 – 2009 for the Noise Sector

Indicator (units)	2005/06	2006/07	2007/08	2008/09	Trend
Number of Premises with POEO Noise Licenses (Licence Holders)	2	2	2	2	Stable
Level of community concern regarding noise (Complaints to Council and DECCW)	1	0	1	1	Stable

Introduction

Noise can be annoying, interfere with speech, disturb sleep or interfere with work. Prolonged exposure to loud noise can also result in increased heart rate, anxiety, hearing loss and other health effects. The impacts of noise depend both on the noise level and its characteristics and how it is perceived by the person affected (DECCW 2009a).

In NSW, noise pollution is regulated through the Protection of the Environment Operations Act 1997 (POEO Act). The POEO (Noise Control) Regulation 2008 also sets certain limits on noise emissions from motor vehicles, vessels and domestic use of certain equipment. Council shares responsibility for enforcing noise control regulations with DECCW, NSW Police and NSW Maritime (DECCW 2009a).

There are a number of potential sources of noise pollution in the Glen Innes Severn Local Government Area, including agricultural, mining, forestry and waste management operations, heavy vehicle highway traffic and domestic noise such as barking dogs and parties.

Pressure

Pressures are defined as human activities and impacts. The main human activities that may impact on noise in the Glen Innes Severn Local Government Area include agriculture, mining, forestry, waste management, transport and residential industrial and commercial development. Some of these pressures are discussed in more detail below.

Agricultural, Mining and Forestry Activities and Urban Fringe Conflict

Agricultural, mining and forestry operations by nature are potential producers of noise pollution. Activities such as harvesting, aerial spraying, milling and extraction generally use machinery that generate decibel levels above that considered polluting. The expansion of urban fringe areas into rural lands could, if inappropriately located, lead to an increase in noise complaints for urban settlers unaccustomed to the sound of rural operations.

Traffic Volume on the New England Highway
The number of vehicle movements on the New England Highway (being the major through route) is noted in the *Air* sector above. If traffic volume increases on the New England Highway, it will be accompanied by an increase in noise generation.

Domestic Noise Issues
Domestic noise, such as barking dogs, parties, alarms and machines can create noise pollution and conflict between neighbours.

State

'State' in this context refers to the current state or condition of noise in Glen Innes Severn Local Government Area. State can potentially be measured through indicators such as the number of premises with POEO Noise Licenses (measured by the number of current licences with noise conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act) and the level of community concern regarding noise (measured by the number of noise complaints reported to Council and the DECCW Environment Line). Each of these potential indicators and the state of noise in Glen Innes Severn Local Government Area are discussed below.

Premises with POEO Licences including noise conditions
During 2008/09, the number of premises with POEO Noise Licenses (measured by the number of current licences with noise conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act) in Glen Innes Severn Local Government Area was two. The licensed operations were Rangers Valley Feedlot and the Glen Innes Waste Management Depot. As these licences have been in place since before 2005, it can be assumed that this indicator has stayed constant from 2005 to 2009 with two premises holding licences throughout this period.

Community Noise Issues
During 2009-2013, DECCW received 1 complaint to its Environment Line regarding noise.

During 2009-2013, Council issued 52 letters to residents requiring them to control barking dogs.

During 2009-2013, Council dealt with 57 barking dogs, 1 motor bikes and 1 loud music issue.

Community Consultation on the State of the Environment Report
Community consultation, undertaken on this report, revealed the following community issues related to noise in Glen Innes Severn Local Government Area:

- On Meade Street there is too much noise due to increase in traffic volume, horn use, traffic speed and number of trucks on road
- Wind towers- some community members have concerns about noise generated by wind towers
- Social events- Public announcements at sporting events are too loud
- Residents generally let neighbours know when parties are happening- this works well
- Police deal with after hours issues.

Response

Development Conditions
Council imposes conditions on development approval within the Shire to ensure that noise pollution does not occur. Development applications are scrutinised for noise generating potential and conditions such as requiring the monitoring of noise levels and limiting the hours of operation may be placed on potential noise generation activities.

State Legislation
Environmental and Planning safeguards established in State legislation also help to protect against the development of inappropriate noise generating activities in the future.

Glen Innes Severn Council Land Use Strategy
This Strategy takes into account the potential conflict created by noise pollution when developing a strategy to plan the future development of the Glen Innes Severn Local Government Area. The following recommendations are made in relation to noise:

- Minimise future air quality and noise related impacts:
    - Consider possible air and noise impacts during the development assessment process to ensure future developments are located appropriately and that appropriate controls and/or mitigating measures are conditioned.
    - Ensure appropriate controls are implemented to reduce the potential air and noise impacts from future developments.
    - Prohibit domestic wood heaters, especially in urban areas.
- Implement strategies to minimise air and noise related impacts, including
    - Develop a register of noise complaints so that continual breaches can be identified and penalised if necessary.
    - Enforce and monitor implementation of noise and air controls.
    - Educate residents on how to minimise air pollution by the appropriate use of wood heaters.
    - Educate residents on the impacts associated with air and noise pollution.

Conclusions

Noise does not appear to be a significant issue in Glen Innes Severn Local Government Area due to the regulations applied through Council and NSW government agencies.

ABORIGINAL HERITAGE

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the Aboriginal Heritage sector is presented in Tables 27, 28 and 29. These issues are discussed further under the ensuing headings.

Table 27: Summary of Pressures, States and Responses for the Aboriginal Heritage Sector (note information across rows does not necessarily directly relate to each other)

Pressure	State	Response
Agriculture	Protection of Aboriginal sites	National Parks and Wildlife cultural education
Mining	Maintenance of culture	DECCW Cultural Heritage Program
Transport		Border Rivers Gwydir Catchment Management Authority Culturally Significant Sites Project
Residential, commercial and industrial development		Glen Innes Severn Local Government Area Aboriginal Heritage Study

Table 28: Summary of Potential Indicators for the Aboriginal Heritage Sector

Potential Indicator	Potential Measurement
Number (of types) of Aboriginal Sites	Sites recorded through DECCW and Glen Innes Severn Council databases

Table 29: Indicator Values 2005 – 2009 for the Aboriginal Heritage Sector

Indicator (units)	2005/06	2006/07	2007/08	2008/09	Trend
Number (of types) of Aboriginal Sites	?	?	?	?	Insufficient data

Introduction

Aboriginal people have lived in NSW for more than 40,000 years. Evidence for this is everywhere, in rock art, stone artefacts and other sites across the state. The Aboriginal language groups whose traditional lands lie in the New England Tablelands Bioregion include the Ngoorabul around Glen Innes, the Bundjalung on the north-eastern side and the Banbai people around Ben Lomond and Mt Mitchell.

Aboriginal people used the landscape as both a natural and cultural resource and there is a strong oral history indicating seasonal movement of Aboriginal people through the rugged gorge system, between the coastal plains and tablelands. The tablelands were occupied during summer and autumn, communities moving either to the coast or the western river systems for winter.

Archaeological evidence suggests the tableland Aborigines traded with groups on the Western slopes and that a range of stone tools such as jagged spears, boomerangs and waddies were developed with local and traded stone and local hardwood. Mammals such as kangaroo and possum were used for food, clothing and decoration. The region is also known for ornately carved trees, ceremonial bora grounds and art sites, indicating an intimate spiritual, as well as a physical, attachment to the sacred landscape the Aboriginal people inhabited.

Aboriginal people of the New England Tablelands worked as stockman on stations. Generally, they had a good relationship with most station managers and the women were engaged in domestic duties (DECCW 2008b).

The Cooramah Aboriginal Cultural Centre provides artefact and craft displays, an art gallery and education centre with regular programs being delivered to schools in the region on the history of Aboriginal people in the area.

A number of Local Aboriginal Land Council (LALC) and Aboriginal groups and communities exist within the region including (but not limited to):

- Glen Innes Local Aboriginal Land Council
- NSW Aboriginal Land Council.

Pressure

Aboriginal heritage can include sites of significance, rock art, engravings, carvings, stone tools, artefacts, rock shelters, occupation sites, scarred trees, burial sites, and the living, ongoing Aboriginal culture which is deeply linked to the entire environment - plants, animals and landscapes. The land and waterways are associated with dreaming stories and cultural learning that are passed on today. It is this cultural learning that links Aboriginal people with who they are and where they belong (DECCW 2009b).

Protecting Aboriginal heritage involves not just looking after sites in parks or artefacts in museums but ensuring that Aboriginal people can access land to renew their cultural learning and be involved and consulted in the conservation of the natural environment (DECCW 2009b).

Pressures on Aboriginal heritage can include physical damage to sites through farming, transport, development and mining. These pressures may also lead to a loss of access to land for Aboriginal people to undertake cultural practices. Other pressures include the loss of cultural knowledge and cessation on passing on of cultural knowledge.

It is difficult to measure Aboriginal heritage through indicators. A potential indicator that might be used is the number (of types) of Aboriginal Sites as this list of relics and sites gives an indication of the total number of items of significance in the Shire. However it is difficult to access this information as it is held confidentially by relevant government agencies.

State

Loss of items of significance

The loss of sites of significance and artefacts is directly related to land development in the area whereby excavation works destroy these items.

Loss of information regarding sites

Since European settlement, stories of sites of significance and historical facts have been lost due to the partial disintegration and separation of Aboriginal groups. For a

variety of reasons, elders are often unable to convey the stories to the younger generations. Additionally, written accounts of Aboriginal heritage may be lost due to fires or inadvertent disposal.

A number of sites of significance are located throughout the Shire. These sites are recorded by DECCW and may be sourced through a search of the database. These sites hold significance to the local Aboriginal community and thereby their location should remain confidential.

Community Consultation for the State of the Environment Report
The following issues were raised by community members during consultation on the State of the Environment report in October 2009:

- Council needs to know where Aboriginal heritage sites are to manage them- hopefully Aboriginal Heritage Study will help with this
- The Aboriginal birthing site (rocks) and the creek near Craigieburn Caravan Park and Cooramah should be listed as an archaeological site

Response

Local Environment Study 1999
An overview of Aboriginal and European heritage was undertaken by A C Gorman in 1998 as part of the Local Environmental Study 1999 for the shire.

Roadside Management Guide
Aboriginal and European heritage roadside sites have been identified in the Roadside Management Guide.

Council policy
Council takes a number of measures to protect Aboriginal heritage. If a development is likely to threaten an Aboriginal relic then it is a condition of development that work must stop and the project manager must contact NPWS for direction.

During road construction by Council's engineering department, if an artefact is found then work ceases and the issue is referred to NPWS.

Glen Innes Severn Council Land Use Strategy
This Strategy aims to acknowledge and respect the important Aboriginal cultural heritage of the Glen Innes Severn Local Government Area in assessing the appropriateness of new uses and development under the planning controls. It also aims to develop decision-making provisions and protocols that will integrate into state systems for managing cultural heritage.

Strategic directions and actions related to Aboriginal heritage include:

- Preserve and enhance the Aboriginal heritage and culture of the Glen Innes Severn Local Government Area, by:
    - Identify the Aboriginal heritage significance of Glen Innes Severn Local Government Area, in consultation with local Aboriginal groups.
    - Collect oral histories with a view to identifying significant places and preserving traditional Aboriginal knowledge as well as contemporary experiences.
    - Develop an Aboriginal heritage management plan that identifies significant places and records traditional Aboriginal knowledge.

- Develop provisions that ensures any development likely to threaten Aboriginal relics are preceded by an archaeological investigation to assess the likely impact upon them (GHD 2009).

Aboriginal Heritage Study
During 2007/08, Council engaged consultants to commence on an Aboriginal Heritage Study for the Local Government Area which is jointly funded by Council and the Heritage Branch. The aim of the study is to identify places of significance, record those places and develop recommendation for their management and conservation.

The study aims to investigate the Aboriginal historical context of Glen Innes Severn Local Government Area, and in association with the Aboriginal community, it then identifies, assesses and records items or places of Aboriginal cultural significance. The study will explain why the places are significant to the Aboriginal Community and recommend ways of managing and conserving that significance.

Border Rivers Gwydir Catchment Management Authority
During 2008/09, the Border Rivers Gwydir Catchment Management Authority undertook the project 'Culturally Significant Lagoons and Salt Affected Sites Project'. This project identified some culturally significant sites in the Glen Innes Severn Local Government Area and prioritised works for the protection of these.

National Parks and Wildlife Cultural Heritage Education
Through its cultural heritage education program, the National Parks and Wildlife Service provide interpretive information in National Parks and run a Discovery program to teach people about cultural heritage in the region.

Aboriginal heritage surveys are undertaken in National Parks and road maintenance and NPWS operational guidelines require the protection of any heritage items.

Conclusions

While little information is available to provide an indication of the state of Aboriginal Heritage in Glen Innes Severn Local Government Area, much effort has been exerted over the last two years to make progress in terms of understanding and protecting Aboriginal heritage in the Local Government Area.

The completion of the Aboriginal Heritage Study and implementation of the actions of the Glen Innes Severn Land Use Strategy have the potential to make a difference to the management of Aboriginal heritage in Glen Innes Severn Local Government Area.

NON-ABORIGINAL HERITAGE

Summary

A summary of the pressures, states and responses, potential indicators and indicator values for the Non-Aboriginal Heritage sector is presented in Tables 30, 31 and 32. These issues are discussed further under the ensuing headings.

Table 30: Summary of Pressures, States and Responses for the Aboriginal Heritage Sector (note information across rows does not necessarily directly relate to each other)

Pressure	**State**	**Response**
Agriculture	Damage or demolition of heritage sites	Local Heritage Assistance Fund
Mining		Community Based Heritage Study
Transport		Heritage Painting Scheme
Residential, commercial and industrial development		Heritage Advisors
		State and Federal heritage protection legislation
		Glen Innes Severn Council Draft Cultural Plan
		Museum

Table 31: Summary of Potential Indicators for the non-Aboriginal Heritage Sector

Potential Indicator	**Potential Measurement**
Heritage Sites in Registers (Local, State, Etc)	The number of sites in Schedule 2 of the Local Environment Plan

Table 32: Indicator Values 2005 – 2009 for the non-Aboriginal Heritage Sector

Indicator (units)	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**Trend**
Heritage Sites in Registers (number of sites on LEP Schedule 2)	158	158	152	151	Decreasing

Introduction

Heritage is all the things that make up Australia's identity - our spirit and ingenuity, our historic buildings, and our unique, living landscapes. Our heritage is a legacy from our past, a living, integral part of life today, and the stories and places we pass on to future generations (Department of Environment Water Heritage and the Arts 2009c).

The Glen Innes Severn Local Government Area has a long agricultural history and settlements largely grew up in response to agricultural development as well as mining development. The locations of raw materials and markets, and traditional transport routes have determined much of the settlement pattern, thereby contributing to the rich and diverse cultural landscape (GHD 2009).

European heritage also consists of landscapes, places, buildings and groups of buildings, and precincts. The built heritage of Glen Innes displays a great diversity of types and styles, reflecting the unique processes that have shaped its towns, villages and rural centres. The development of many settlements can be traced through the locations and styles of their buildings. The Grey Street Precinct is one such area that promotes the Local Government Area's cultural built heritage (GHD 2009).

Photos 16 and 17: Glen Innes celebrates its Celtic heritage

Pressure

Non-Aboriginal heritage may be impacted by physical damage to heritage buildings or sites. The challenge is to retain significant structures, cultural sites and buildings while maintaining a practical use thus allowing property owners and the community to benefit and retain local, state and national heritage. Funding the restoration or maintenance of these buildings and maintaining practical uses for the buildings presents a problem to the property owners.

Pressures on non-Aboriginal heritage can include damage or demolition to sites through farming, transport, development and mining. Development is the greatest of these pressures and it is discussed below.

Development Pressure

The built environment is facing pressure from development. The number of development applications assessed by Council increased from 129 in 2005/06 to 139 in 2012/2013. Inappropriate development can lead to the damage or demolition of heritage sites.

State

The state, or condition, of non-Aboriginal heritage in Glen Innes Severn Local Government Area can be judged through the following potential indicator: Heritage Sites in Registers (Local, State, etc) as the list of sites in Schedule 2 of the Local

Environment Plan gives an indication of the total number of protected buildings in the Shire. Issues related to the state on non-Aboriginal heritage are discussed below.

Items on Local Heritage Register
There were 158 sites gazetted in the Glen Innes Local Environmental Plan of 1991 as items of Heritage significance. This in effect will mean owners of heritage items will not be able to alter or demolish these buildings without Council giving consideration to the heritage value of the buildings. Council encourages buildings to be altered in a way that is sympathetic to the original building.

Items of Commonwealth and State Heritage Significance
There are 5 items of listed on the Register of the National Estate in the Glen Innes Severn Local Government Area. These are the Glen Innes Courthouse, Glen Innes Post Office, Glen Innes Public School, Glen Innes Town Hall and the Land Of the Beardies History House Museum.

There are 2 items listed on the NSW Heritage Register. These are the Glen Innes Post and Telegraph Office and the Glen Innes Railway Station Group.

There is one item listed on the World Heritage Register. This is the Gondwana Rainforests of Australia which includes Washpool and Gibralter Range National Parks.

These items enjoy a level of protection above that offered in the Local Environmental Plan. The inclusion of natural items of heritage value is seen as progress towards accepting attributes of the bio-physical environment as important in our culture.

Response

Community Based Heritage Study
The Community Based Heritage Study, commenced in 2008/09, will assess the existing heritage items identified in the Local Environmental Plan and a heritage committee will be established to review potential heritage items. These items could include buildings in towns, homesteads, shearing sheds, fences, cemeteries, trees and other landscape features, including potential archaeological sites. Each item will be assessed by a number of criteria.

Glen Innes Severn Council Local Heritage Fund 2012/2013
During 2008/09, Glen Innes Severn Council assisted to fund six heritage projects through the Local Heritage Fund. Alongside contributions from other funding partners, the total cost of the projects came to $29,181.

Glen Innes Severn Council Draft Cultural Plan 2013
The reason for Glen Innes Severn Council to have a Cultural Plan is to recognise the importance of Culture as a concept underpinning our community values, fabric and connectedness. This is particularly important when Council is producing strategic and operational plans and implementing the actions contained within those plans. This will result in a holistic view of our community and deliver positive outcomes for future development and community engagement whereby this Cultural Plan will be the driver (Glen Innes Severn Council 2009d).

Glen Innes Severn Land Use Strategy
This strategy provides the following strategic actions and directions for heritage:

- Promote and enhance the communities awareness of the unique heritage and culture of the Glen Innes Severn Shire LGA

- Undertake a community based heritage study to identify what is important to the community in terms of heritage conservation.
- Increase community awareness and involvement in identifying, protecting and enhancing heritage, especially Aboriginal heritage.
- Develop and implement an education program informing the community on the benefits of heritage conservation.
- Continue to provide free heritage advice to residents.
- Encourage landowners to prepare conservation plans for significant items and places.
- Support cultural and tourist activities, which promote rural heritage.

- Preserve and enhance the unique European heritage and culture of the Glen Innes Severn Shire Local Government Area
  - Identify items, landscapes, areas, items and places of European heritage significance in Glen Innes Severn Local Government Area in consultation with the community.
  - Create inventories of identified heritage for inclusion in the LEP.
  - Provide appropriate protection of these sites in the LEP.
  - Prepare a DCP to support the LEP and provide additional detailed guidelines and protection for development in relation to heritage.
  - Incorporate decision-making criteria to determine the acceptability of use and development affecting landscapes, areas, places and items of identified heritage significance.
  - Ensure that the planning scheme is sufficiently flexible to consider adaptive reuse of heritage places where this would contribute to their survival and ongoing management.
  - Review the existing development control plans for villages with identified heritage character, and amend where necessary.
  - Develop streetscape protection measures for all villages (GHD 2009).

Museum

Museum facilities are currently funded by State, Local Governments and the local communities. Additional funding and resources will be required to enhance the facilities and gather further data and equipment for displays.

Heritage Committee

The Heritage Committee of Council advises Council regarding development or Building Applications that may affect heritage listed buildings.

Heritage Advisor

Council employs a Heritage Advisor consultant to give advice on heritage matters. Mr. Graham Wilson has been retained as the Advisor for Glen Innes Severn Council at this time.

Heritage Painting Scheme

The Glen Innes Severn Council has a Heritage Painting Scheme within the Grey Street precinct and this painting scheme is controlled by the co-operation of the landowners. Many efforts have been made in the past to ensure that owners paint the facades of their building in the recommended colours supplied by Council's consultants. However, some corporate bodies wish to paint their corporate colours and consequently this interfered with the overall Grey Street concept. A development control plan is needed to ensure continued compliance with heritage colours.

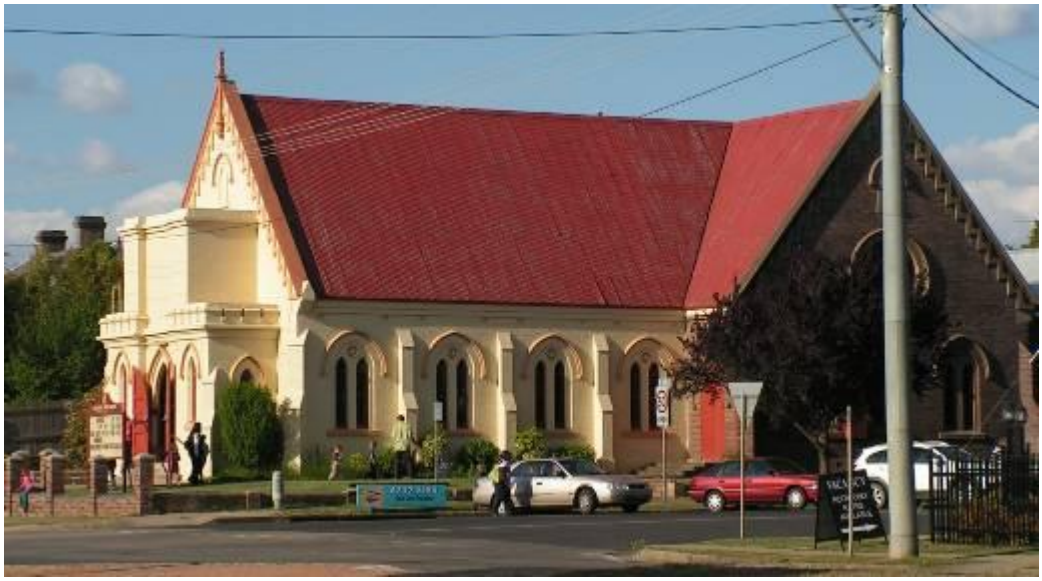


Photo18: One of Glen Innes' many heritage buildings

Conclusions

Heritage is a source of pride for the Glen Innes Severn Local Government Area community and the extent of measures undertaken to protect this heritage is a testament to this fact. Council and State and Federal Government agencies have developed a number of well funded programs with clear directions for the future which should continue to progress the successful protection of this heritage.

RECOMMENDATIONS

Recommendations for State of the Environment Reporting

Indicators

Comprehensive State of the Environment Reporting for Local Governments needs to be done in a way that is meaningful, repeatable, comparable over many years, and able to be understood by the community, Council representatives and staff and key stakeholders.

It is important therefore that indicators for each environmental sector are chosen on the basis that data is available for the indicator, the indicator is directly relevant to the state of the sector and the methodology for assessing the indicator is able to be repeated each year. Indicators can reflect direct impacts on the state of the environmental sector, surrogate representations of the environmental sector or responses to pressures on that environmental sector, in order to give an indication of the priority that the environmental sector is given in the Local Government Area.

Based on these criteria, indicators for each sector were developed or reviewed from those used in previous State of the Environment reports and the best indicators were selected. The reasons why certain indicators were chosen is discussed in greater detail in the chapters addressing each environmental sector. It is recommended that these indicators are used for all future State of the Environment reporting for Glen Innes Severn Council. The indicators are summarised in Table 33.

Table 33: Summary of Indicators for each Environmental Sector

Environmental Sector	Indicator	Measurement
Land	Level of community concern regarding contaminated sites and/or land in general	Number of calls received by Environment Line
Land	Number of contaminated sites	Number of sites listed on the contaminated sites record under the Contaminated Land Management Act
Land	Level of development	Number of developments assessed
Land	Level of appropriate development	Number of development approvals related to rural subdivisions
Land	Protected Area Estate	Area of land managed as protected area by National Parks And Wildlife Service (hectares)
Water	Water use	Kilolitres (kL) domestic water consumed per year
Water	Water quality	Compliance/non compliance with Sewage Treatment Plant licence requirements
Water	Waterways protected	Kilometres (km) of fencing constructed to protect waterways
Water	Level of community concern regarding water	Number of calls received by Environment Line regarding water

Biodiversity	Area of native vegetation cleared per year (ha)	Area of vegetation cleared (in hectares) reported through Property Vegetation Plans notified to Council from Northern Rivers Catchment Management Authority and Border Rivers Gwydir Catchment Management Authority
Biodiversity	Areas known to have been revegetated (ha)	Area of land revegetated (in hectares) as reported through Catchment Management Authorities and Land Care
Biodiversity	Extent of protected areas (ha)	Area of land protected for nature conservation (in hectares)
Biodiversity	Level of community concern regarding biodiversity	Number of calls received by Environment Line
Biodiversity	Actions taken to improve the conservation of specific species of flora and fauna listed under the TSC Act and other legislation	Number of actions listed through Threatened Species Recovery Plans
Biodiversity	Actions taken to minimise the impact or reverse the spread of species of declared noxious weeds	Number of weeds targeted
Biodiversity	Actions taken to minimise the impact or reverse the spread of species of declared feral animals	Number of feral animals targeted
Biodiversity	Total fauna and flora species recorded	Total number of species listed for Glen Innes Severn Local Government Area on the DECCW Wildlife Atlas
Waste	Total Waste Disposed	Waste generated per head of population per year (kilograms per person per year)
Waste	Capacity of Waste Landfill Sites	Life expectancy of landfill sites (years)
Waste	Level of community concern regarding waste	Number of calls received by Environment Line regarding waste
Air	Number of Premises with POEO Air Licenses	Number of current licences with air conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act
Air	Number of Premises with POEO Air Licenses	Number of current licences with air conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act
Air	RTA vehicle counts for the New England Highway	Number of Vehicles
Air	National Pollutant Inventory emissions for Glen Innes Severn	Total emissions (kg/year) according to National Pollutant Inventory

	Local Government Area	
Noise	Number of Premises with POEO Noise Licenses	Number of current licences with noise conditions listed on the Public Register of Environment Protection Licence Holders under the Protection of the Environment Operations Act
Noise	Level of community concern regarding noise	Number of noise complaints reported to Council and the DECCW Environment Line
Aboriginal Heritage	Number (of types) of Aboriginal Sites	Sites recorded through DECCW and Glen Innes Severn Council databases
Non-Aboriginal Heritage	Heritage Sites in Registers (Local, State, Etc)	The number of sites in Schedule 2 of the Local Environment Plan

The indicators chosen are probably the most important component of State of the Environment reporting, as these provide an insight into environmental issues. These indicators cover a range of issues related to the environment (scientific data, community concern, regulatory actions, responses undertaken) and should provide a good overview of the state of the environment in Glen Innes Severn Local Government Area.

Recommendations for each Environmental Sector

This State of the Environment Report provides a number of recommendations based on environmental sector. These recommendations are summarised below.

Land

The Glen Innes Severn Local Government Area is experiencing increasing development which is good for the economy in regional areas. Development control could be improved through the finalisation and acceptance by Council of the Development Control Plan.

Glen Innes Severn Local Government Area is also fortunate to be home to a pro-active Land Care network and many enthusiastic land holders who wish to manage the environment in a sustainable manner. Support and collaboration from agencies such as the Catchment Management Authorities further enhances the community and government's commitment to environmental sustainability and this continuation of these arrangements is recommended.

Council staff involved in works that may lead to land degradation or contamination should continue to be trained in best practice land management.

Council to develop a Climate Change Adaptation Strategy that identifies the most appropriate land uses in the face of climate change and adaptation measures that land managers can implement to avoid the worst impacts of climate change, see Australian Greenhouse Office, Department of Environment and Water Resources (2007).

Water

The indicators for water suggest that the state of water in Glen Innes Severn Local Government Area is improving. Since 2005, there has been an increase in waterways protected, a decrease in water use and a decrease in community concern regarding water. Initiatives such as the new Sewage Treatment Plant will assist in maintaining good water quality for the area. It is

recommended that a waterways health monitoring program for rural and urban waterways is established in Glen Innes Severn Local Government Area.

Biodiversity

Glen Innes Severn Local Government Area is fortunate to be home to high levels of biodiversity, a large proportion of endemic species and threatened species that are no longer found in other areas of Australia. It is also fortunate to have a number of government agencies that work cooperatively together for the benefit of the environment and Land care groups and community members who contribute significantly towards the conservation of biodiversity.

The indicators for the biodiversity sector show that community concern and possibly interest in biodiversity is increasing. Natural resource management programs such as revegetation programs have fluctuated over the years in accordance with funding available and prioritisation of work undertaken. A continued, constant investment in revegetation and biodiversity projects would benefit the biodiversity of Glen Innes Severn Local Government Area.

In order to protect biodiversity, Council planning documents such as the Draft Land Use Strategy and the proposed new Local Environment Plan should be developed, approved and accepted by Council expeditiously so that the control measures for biodiversity within these can be implemented.

It is recommended that Glen Innes Severn Council investigate funding assistance and consider developing a climate change policy for the Local Government Area.

Continuation of Council's noxious weeds and the Livestock Health and Pest Authorities feral animals programs are recommended. These programs contribute to reducing the impact of these significant threats to biodiversity and production in the Glen Innes Severn Local Government Area.

High Conservation Value areas, such as those located on Travelling Stock Routes are currently not well documented. It is recommended that these areas be documented so that the management can be customised to meet the requirements of these sensitive ecosystems.

The Glen Innes Severn Local Government Area community may benefit from further education of the biodiversity values found within its surrounds. Council could develop some educational tools to inform the community of local biodiversity and threatened species, including those in urban and rural areas.

Waste

Council's waste initiatives have lead to an increase in recycling since the recycling program's inception in 1996, and Council continues to introduce new, progressive waste management programs.

Council will need to resolve the landfill expansion issue in due course in order to meet future waste processing requirements.

Air

Pollution is decreasing in Glen Innes Severn Local Government Area, which is good news for air quality.

Noise

Noise does not appear to be a significant issue in Glen Innes Severn Local Government Area due to the regulations applied through Council and NSW government agencies.

It may be useful to establish a register of noise complaints in order to monitor any issues that might lead to noise pollution.

Aboriginal Heritage

Much effort has been exerted over the last four years to make progress in terms of understanding and protecting Aboriginal heritage in the Local Government Area.

The completion of the Aboriginal Heritage Study and implementation of the actions of the Glen Innes Severn Land Use Strategy have made a difference to the management of Aboriginal heritage in Glen Innes Severn Local Government Area.

Non Aboriginal Heritage

Heritage is a source of pride for the Glen Innes Severn Local Government Area community and the extent of measures undertaken to protect this heritage is a testament to this fact. Council and State and Federal Government agencies have developed a number of well funded programs with clear directions for the future which should continue to progress the successful protection of this heritage.

Continue the Heritage Assistance Fund and undertake the Community Based Heritage Study with the aim to encourage as much positive work on heritage items in the area as possible.

CONCLUSION

Over the past four years, Glen Innes Severn Local Government Area has made substantial advances in environmental management. Improvements to the new sewage treatment plant, a progressive and growing waste recycling program, significant investment from natural resource management funding bodies, a substantial protected area estate, an increase in water efficiency and a proactive community means that Glen Innes Severn Local Government Area is maintaining its environment in a good condition.

Glen Innes Severn Council is looking forward to further improving and protecting its environment through major projects such as energy savings initiatives and an extension of the landfill at Glen Innes Waste Management Facility. Acceptance of strategies such as the Glen Innes Severn Land Use Strategy will assist Council to efficiently plan and develop the Local Government Area.

The development of a waterways health monitoring program and a climate change strategy for the Local Government Area will further benefit Council and stakeholders in understanding potential environmental impacts and managing these.

Continued education and awareness building for Glen Innes Severn's community to facilitate their involvement and engagement in environmental issues should also be a high priority. For Council staff, knowledge of environmental best practice through training and workplace application should assist Council to maintain and improve its standard of environmental management.

Glen Innes Severn Local Government Area, with its high levels of biodiversity, strong heritage and well planned land management is in good stead to maintain its high environmental values and protect its natural heritage into the future.

REFERENCES

Australian Bureau of Statistics (2007a) *Regional Population Growth, Australia, 2004-05* Australian Bureau of Statistics, Canberra, accessed 19/10/09 http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E0EE5BD4C8D83230CA25728E0014D516?opendocument

Australian Bureau of Statistics (2007b) *Regional Population Growth, Australia, 2005-06* Australian Bureau of Statistics, Canberra, accessed 19/10/09 http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3218.0Main%20Features62005-06?opendocument&tabname=Summary&prodno=3218.0&issue=2005-06&num=&view=

Australian Bureau of Statistics (2008) *National Regional Profile* Australian Bureau of Statistics, Canberra, accessed 19/10/09 http://abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/LGA13010Economy12002-2006?opendocument&tabname=Summary&prodno=LGA13010&issue=2002-2006

Australian Bureau of Statistics (2009a) *Regional Population Growth, Australia, 2006-07* Australian Bureau of Statistics, Canberra, accessed 19/10/09 http://www.abs.gov.au/ausstats/abs@.nsf/Previousproducts/3218.0Media%20Release12006-07?opendocument&tabname=Summary&prodno=3218.0&issue=2006-07&num=&view=

Australian Bureau of Statistics (2009b) *Regional Population Growth, Australia, 2007-08* Australian Bureau of Statistics, Canberra, accessed 19/10/09 http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2007-08~Main+Features~New+South+Wales?OpenDocument

Australian Government (2004a) *European wild rabbit (*Oryctolagus cuniculus*)*Australian Government Canberra ACT

Australian Government (2004b) *The feral goat (*Capra hircus*)* Australian Government Canberra ACT

Australian Government (2004c) *The feral pig (*Sus scrofa*)* Australian Government Canberra ACT

Australian Government (2004d) *The feral cat (Felis catus)* Australian Government Canberra ACT

Australian Government (2004e) *European Red Fox (*Vulpes vulpes*)* Australian Government Canberra ACT

Australian Government (2009) *Threatened Species and Threatened Ecological Communities* Australian government Canberra, accessed 10/11/09 http://www.environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl?proc=main

Australian Greenhouse Office, Department of the Environment and Water Resources (2007) *Climate Change Adaptation Actions for Local Government* Commonwealth of Australia, Canberra

Bureau of Meteorology (2009a) *New South Wales in 2008* Commonwealth of Australia, Canberra, accessed 21/10/09 http://www.bom.gov.au/climate/current/annual/nsw/summary.shtml

Bureau of Meteorology (2009b) *Climate Statistics for Australian Locations* Commonwealth of Australia, Canberra, accessed 26/10/09 http://reg.bom.gov.au/climate/averages/tables/cw_056011.shtml

Bureau of Meteorology (2009c) *Year 2007* Commonwealth of Australia, Canberra, accessed 26/10/09 http://www.bom.gov.au/climate/current/annual/nsw/archive/2007.summary.shtml

Bureau of Meteorology (2009d) *New South Wales in 2006* Commonwealth of Australia, Canberra, accessed 26/10/09 http://www.bom.gov.au/climate/current/annual/nsw/archive/2006.summary.shtml

Commonwealth Scientific and Industrial Research Organisation Australia (2007) C*limate Change in the Border Rivers Gwydir Catchment*

Commonwealth Scientific and Industrial Research Organisation Australia (2007) C*limate Change in the Northern Rivers Catchment*

Department of Environment, Climate Change and Water (2007) *NSW Waste Avoidance and Resource Recovery Strategy 2007* DECCW Sydney NSW

Department of Environment, Climate Change and Water (2008a) *Summary of Climate Change Impacts New England/North West NSW Region* DECCW Sydney NSW

Department of Environment, Climate Change and Water (2008b) *New England Tableland: Regional History* DECCW Sydney NSW, accessed 09/11/09 http://www.environment.nsw.gov.au/bioregions/NewEnglandTableland-RegionalHistory.htm

Department of Environment, Climate Change and Water (2009a) *Atlas of NSW Wildlife* DECCW Sydney NSW, accessed 10/11/09 http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp

Department of Environment, Climate Change and Water (2009b) *Threatened Species NSW* DECCW Sydney NSW, accessed 10/11/09 http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/pas_lga_region.aspx?name=Glenn+Innes+Severn

Department of Environment, Climate Change and Water (2009c) *Noise* DECCW Sydney NSW, accessed 08/11/09 http://www.environment.nsw.gov.au/noise/

Department of Environment, Climate Change and Water (2009d) *Aboriginal People and Cultural Life* DECCW Sydney NSW, accessed 09/11/09 http://www.environment.nsw.gov.au/nswcultureheritage/AboriginalPeopleAndCulturalLife.htm

Department of Environment Water Heritage and the Arts (2009a) *Australian Pest Animal Strategy* Australian Government Canberra, accessed 27/10/09 http://www.environment.gov.au/biodiversity/invasive/publications/pest-animal-strategy.html

Department of Environment Water Heritage and the Arts (2009b) *Air Quality* Australian Government Canberra, accessed 09/11/09 http://www.environment.gov.au/atmosphere/airquality/

Department of Environment Water Heritage and the Arts (2009c) *Australia's Heritage* Australian Government Canberra, accessed 09/11/09 http://www.environment.gov.au/heritage/index.html

Environmental Earth Services (2008) *Landfill Feasibility Study- Extension of Glen Innes Waste Management Depot, Rogers Road, Glen Innes into the Adjoining Quarry* Environmental Earth Services NSW

Gale S.J. and R.J. Haworth (2004*) Catchment-wide soil loss from pre-agricultural times to the present: transport- and supply-limitation of erosion* Geomorphology Volume 68, Issues 3-4, 1 June 2005, Pages 314-333

GHD (2006) *Glen Innes Severn Local Environmental Study* GHD Coffs Harbour NSW

GHD (2009) *Glen Innes Severn Land Use Strategy 2009* GHD Coffs Harbour NSW

Glen Innes Severn Council (2006) *Statement of the Environment 2006/06* Glen Innes Severn Council, NSW

Glen Innes Severn Council (2008) *Glen Innes Severn Council Economic Development Strategy 2008-2010* Glen Innes Severn Council Glen Innes

Glen Innes Severn Council (2009a) *Recreation and Open Spaces Management Plan 2009-2019* Glen Innes Severn Council NSW

Glen Innes Severn Council (2009b) *Waste Management: Service Provision: Landfill Feasibility Study Glen Innes Landfill* Glen Innes Severn Council NSW

Glen Innes Severn Council (2009c) *Waste Management: Service Provision: Green Waste Strategy* Glen Innes Severn Council NSW

Glen Innes Severn Council (2009d) *Glen Innes Severn Council Draft Cultural Plan* Glen Innes Severn Council NSW

McLeod, R. (2004) *Counting the cost: impact of invasive animals*. Cooperative Research Centre for Pest Animal Control, Canberra.

National Pollutant Inventory (2008) *National Pollutant Inventory Data* Australian Government Parkes, accessed 11/11/09 http://www.npi.gov.au/cgi-bin/npidbsearch.pl

Northern Inland Weeds Advisory Committee (2009) *Weed Management Guide for North West New South Wales* Print Anything Inverell NSW

NSW Government (1999) *Environmental Guidelines: State of the Environment Reporting By Local Government: Promoting Ecologically Sustainable Development*. NSW Government NSW

NSW National Parks and Wildlife Service (2003) *The Bioregions of New South Wales: their biodiversity, conservation and history* NSW National Parks and Wildlife Service, Hurstville.

Quality Planning (2009) *The Pressure State Response Framework*, accessed 20/11/09 http://www.qualityplanning.org.nz/monitoring/intro-pressure-state-response-framework.php

Roads and Traffic Authority (2005) *Traffic Volume Data for Hunter and Northern Regions 2004* Roads and Traffic Authority NSW