Ballina Shire
Roadside Vegetation Management Plan

An Integrated Roadside Vegetation Management Program

April 2012

GV Consultants

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SUMMARY

Ballina Shire Council in sub-tropical Far North Coast of NSW contains a dense network of rural roads. These rural roadsides contain substantial stands of vegetation. The maintenance of this vegetation to provide safe carriageways is a major commitment requiring considerable resources.

In late 2005 Ballina Shire Council through funding provided by the NSW Government's Environmental Trust commenced a project to improve the understanding of and provide a framework for the management of biodiversity within Ballina Shire's Council managed rural road reserves.

The project commenced with an extensive vegetation survey of the Shire's rural roadsides (Ballina Roadside Vegetation Survey (BRVS), (EnviTE 2006). The survey captured 1378 polygon files and 291 'points' entered onto Council's Geographic Information System (GIS) data base, identifying the extent, condition and significance of the Shire's roadside vegetation and other features within the road reserve.

The survey revealed that Ballina Shire's rural roadsides support a broad range of vegetation communities. The majority of the vegetation in the road reserve has been highly modified with 'agricultural grasses' the most common. Weeds are a major feature of roadside vegetation, 95% of roadside sectors contain significant weed infestations. However, vegetation in the road reserve includes endangered ecological communities (e.g. 'lowland subtropical rainforest') and threatened native flora species and provides significant native habitat. Elements of the current roadside vegetation maintenance practices are impacting on the extent and quality of native roadside vegetation. If managed appropriately to assist regeneration this vegetation may create sustainable, low maintenance sites of increased conservation value.

The BRVS suggested changes to the rural roadside vegetation maintenance regime to bring about improvements in vegetation conservation value. The survey recommended the introduction of six 'vegetation treatments' categories. The 'vegetation treatment' category to be used is based on the type, condition, conservation value and potential for rehabilitation of the roadside vegetation within that sector.

In November 2006 Ballina Shire Council commissioned GV Consultants to prepare the Ballina Roadside Vegetation Management Plan (BRVMP). This plan's aim was to provide an operational plan to guide a rural roadside vegetation management regime that enhances the value of roadside native vegetation, satisfies changing legislation and maintains road safety. The BRVMP provides:

(ii) A Operations Map, outlining a roadside' vegetation treatment category' for all road sectors;

(ii) A Plan containing background information, interpretation of the data collected by the BRVS, prescriptions for each 'vegetation treatment category' and actions to implement the changes in roadside vegetation maintenance; and

(iii) A Field Kit - a guide for on-ground activities to be carried in vehicles and used by field maintenance staff and contractors.

The BRVMP recommends a number of changes to the roadside vegetation maintenance regime. The major changes are:

- A decrease in slashing and side-arm mowing at sites where native vegetation is being damaged. Where vegetation maintenance is required for road safety, alternative pruning methods may be applied;
- The introduction of new roadside 'vegetation treatments' (i) 'Bush Regeneration Only', (ii) 'Slash Only' – 'Side-arm mowing' only as required, (iii) 'Spray Only' and (iv) 'Spray - then Slash'. These maintenance regimes are targeting at enhancing high conservation value vegetation and reducing the spread of weeds; and

- In the long term the introduction of an Integrated Roadside Vegetation Management (IRVM) approach to roadside vegetation management. An IVRM program involves active management of roadside sites to encourage native vegetation to replace exotic grasses and reduce the need for regular maintenance.

Successful implementation of the BRVMP will require:

- Staged modifications to the roadside vegetation management and maintenance regimes;
- Staff training to clarify changes in roadside vegetation management and increase staff awareness of the benefits of native roadside vegetation;
- Ongoing monitoring of the effect maintenance changes are having on (i) road safety, (ii) how the desired changes in the extent and condition of native roadside vegetation is being achieved, (iii) roadside maintenance costs and (iv) community attitudes;
- Regular consultation and cooperation between field staff and Engineering Works and Open Spaces and Reserves Management to evaluate the results of monitoring and review management accordingly;
- Developing new skills in roadside vegetation management to implement an Integrated Roadside Vegetation Management Program such as selecting suitable native species for roadside planting; and
- In the short term additional resources or a reallocation of resources to undertake the above actions.

Roadside vegetation is dynamic, opportunity exists to improve the condition, extent and environmental value of roadside native vegetation without reducing road safety. Whilst in the short term changes in the roadside vegetation maintenance regime may require additional resources, in the long term these changes may reduce maintenance requirements and costs.

It is hoped the recommendations in this Plan assists Council initiate changes in rural roadside management that increase the value of native roadside vegetation whilst maintaining road safety.

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THE BALLINA ROADSIDE VEGETATION MANAGEMENT PLAN

The Ballina Roadside Vegetation Management Plan is comprised of four parts.

1. **Operational Map - Roadside Vegetation Treatments**

A map showing the recommended vegetation management (maintenance) treatments for roadsides. Derived from the data collected through the *Ballina Roadside Vegetation Survey* (EnviTE 2006).

2. **The Ballina Roadside Vegetation Management Plan (BRVMP)**

A reference document useful for planning staff, engineers and background information for those involved in roadside maintenance.

The Plan contains background information on the roadside environment, recommendations for changes in roadside vegetation maintenance, actions on how to implement the plan and best management guidelines to minimise the impact of management activities on roadside native vegetation.

3. **Field Kit**

A kit to assist 'in-the field' operators, maintenance crews and contractors. To be carried in maintenance vehicles as a ready reference guide. Contains the (i) Roadside Vegetation Treatments Map (ii) Background notes (iii) Tables and Maps with the location of a range of roadside attributes and (iv) Reporting Forms.

4. **Electronic data-base**

A 'MapInfo' database of the information collected through the *Ballina Roadside Vegetation Survey (EnviTE 2006), s*tored on Ballina Shire's Geographic Information System. Analysis of this data provided the 'treatment categories', priority sights for active management', weed locations maps, etc contained in the Plan.

HOW TO IMPLEMENT THE BALLINA ROADSIDE VEGETATION PLAN

FIELD STAFF / CONTRACTORS

Roadside Vegetation Maintenance staff and contractors

- Familiarise yourself with the Roadside Vegetation Treatments Map, identify the locations of those sectors were the maintenance regime is to be modified.

IN PARTICULAR WHERE THERE IS A REDUCTION IN MAINTENANCE PROPOSED e.g. NO 'SIDE ARM MOWING'

- Use the most appropriate tools, techniques and timing to implement the vegetation maintenance regime.
- Ensure that roadside vegetation is maintained:
  - as prescribed on the Roadside Vegetation Treatments Map
  - so as to meet legal obligations (Infrastructure SEPP & Threatened Species).
- Become familiar with the location of threatened plants and sites with significant vegetation
- Report concerns either via Report Forms or verbally to Team Leader.
- Provide feedback to 'Engineering Works' and/or 'Open Spaces and Reserves' on
  (i) changing vegetation conditions
  (ii) need for changes in maintenance regimes and
  (iii) outbreaks of new weeds and other observations

Roadside Maintenance and Construction staff and contractors

- Familiarise yourself with the material in the Field Kit.
- Keep a copy of Field Kit and Maps in your vehicle.
- Familiarise yourself with the Best Management Practices Guidelines (Appendix 8) for roadside maintenance activities.

DESIGN ENGINEERS and MAINTENANCE ENGINEERS

- Use the Ballina Shire Roadside Vegetation Management Plan (BRVMP) as a reference document when planning and coordinating road construction and maintenance works.
- Inform and train field staff as recommended in the BRVMP.
- Ensure roadside vegetation is maintained according to the Vegetation Treatments Map

OPEN SPACE AND RESERVES UNIT

- Work in cooperation with Maintenance Engineers to implement the BRVMP.
- Use the recommendations in the BRWMP as a guide for prioritising and programming roadside vegetation rehabilitation works and for funding applications.
- Review and update the BRVMP as required.

BUSH REGENERATORS AND ARBORIST

- Undertake works as directed at sites where native vegetation is to be managed with hand tools.

ABBREVIATIONS

BRVS : The Ballina Roadside Vegetation Survey (EnviTE 2006)

BRVMP : Ballina Roadside Vegetation Management Plan

DLWC : Department of land and Water Conservation

BSC : Ballina Shire Council

BFMC : Bush Fire Management Committee

CMA : Catchment Management Authority

DNR : Department of Natural Resources

DPI: Department of Primary Industry

DTI : NSW Trade and Investment (Nee DPI, NSW Fisheries and NSW Agriculture)

EEC : Endangered Ecological Community (Under the NSW Threatened Species Conservation Act)

FNCW : Far North Coast Weeds

IRVM : Integrated Roadside Vegetation Management (Program)

IWM : Integrated Weed Management

LALC: Local Aboriginal Land Council

LGA: Local Government Area

LPMA : Land and Property Management Authority

NPWS : National Parks and Wildlife Service (NSW)

NRCMA : Northern Rivers Catchment Management Authority

OEH : Office of Environment and Heritage (nee NPWS)

REC : Roadside Environment Committee (of the RMS)

RMS : Roads and Maritime Services (Nee RTA)

RTA : Road and Transports Authority (NSW)

TSCA : NSW Threatened Species Conservation Act (1995)

1. INTRODUCTION

1.1 Background

Ballina Shire is situated in the North east corner of NSW. The Shire covers an area of 487 square kilometres supporting a growing population of over 40,000 in the towns of Alstonville, Lennox Head and Wardell and the surrounding rural district. The Shire is bordered by Lismore City, Byron and Richmond Valley Shires.

Ballina Shire supports an extensive rural road network with 20 kms of State Highways (Pacific Highway and Bruxner Highway), 63 kms of regional roads, 229 kms sealed local roads and 117 kms unsealed local roads. The majority of roads are managed by Council with the exception of the major highways and arterial roads which are managed by the NSW Roads and Maritime Services (RMS).

The coastal sub-tropical climate, diverse topography and varied soils create a range of habitats supporting a wide diversity of flora and fauna species, a number of which reach their southern or northern limits. The favourable climatic conditions promote rapid vegetative growth including a range of aggressive weed species.

Large areas of native vegetation in the Shire were cleared from the mid 19th century onward. In some areas roadside vegetation provides a valuable refuge of 'native habitat'. Roadside remnants include sub-tropical rainforest, sclerophyll forest types and wetlands. Natural regeneration is occurring in these remnants demonstrating a high degree of ecological resilience and opportunities for rehabilitation.

The Ballina Roadside Vegetation Management Plan (BRVMP) provides information on how changes to roadside vegetation maintenance may find a balance between environmental values, road safety and maintenance costs.

1.2 Why a Roadside Vegetation Management Plan

The many uses of roadsides creates diverse demands and possible conflict due to different values, desires and responsibilities, To achieve a functional approach that balances practical management, safety and the conservation roles of roadside areas a common agreed upon strategic approach is required. Such an approach needs to consider the full range of roadside functions and issues.

A roadside vegetation management plan:

- identifies roadside environmental and cultural values;
- collects and presents information to improve the knowledge and understanding of the issues involved in roadside management by all stakeholders;
- provides a resource to guide roadside vegetation management, with the intent to save time and effort in the long term and satisfy the desires of all road users: and
- may lead to improved communication and co-ordination between the stakeholders in roadside management.

1.3 Scope of the Plan

The Ballina Roadside Vegetation Management Plan (BRVMP) provides a framework for managing vegetation on rural roadsides, (roads with a speed limit above or equal to 60km/h), under the management of Ballina Council. The plan excludes the Pacific and Bruxner Highways and roads with speed limits 60 kilometres and under.

The BRVMP contains:

1. Data on what is found along Ballina Shire's roadsides and in road reserves: from the findings of the Ballina Roadside Vegetation Survey;
2. Background information relevant to roadside vegetation management including policies and legislation;
3. An outline of activities impacting or with the potential to impact on roadside vegetation;
4. A list of actions to maintain and enhance native roadside vegetation;
5. Guidelines for best management work practices to reduce the impact on native roadside vegetation of road maintenance, minor construction, and service provision.; and
6. The reporting and review requirements of the BRVMP.

1.3.1 Responsibilities of Council for road reserve management

A number of Acts of Parliament influence the management of Roadside Vegetation in NSW. Council needs to ensure all works or activities conducted within road reserve areas have prior Council permission and are being conducted subject to the requirements under the relevant Act(s) of Parliament.

Acts relevant to roadside vegetation management: (See Appendix 10 for details)

- Clean Waters Act 1970,
- Coastal Protection Act 1979,
- Crowns Land Act 1989
- Electricity Supply Act 1995,
- Fisheries Management Act 1994
- Environmental Planning and Assessment Act 1979,
- Forestry Act 1916
- Heritage Act 1977
- National Parks and Wildlife Act 1974
- Native Vegetation Management Act 1987
- Noxious Weed Act 1993
- Rivers and Foreshores Improvement Act 1948
- Roads Act 1993
- Rural Fires Act 1997
- Threatened Species Conservation Act 1995
- SEPP 14 Wetlands Policy
- SEPP 26 Littoral Rainforest Policy
- SEPP 44 Koala Habitat Policy
- State Environmental Planning Policy (Infrastructure) 2007

The activities permitted within the road reserve with and without consent are defined in Division 17 of the State Environmental Planning Policy (Infrastructure) 2007 (Amended). The relevant section of the SEPP may be found in Appendix 10. The Infrastructure SEPP overrides much of the protection offered to native flora and fauna by the Threatened Species Conservation Act and earlier SEPPs.

1.3.2 Distribution of the BRVMP

It is recommended this document be distributed to:

- Civil Services : Manager, Line Managers – Engineering Works, Infrastructure Planning, Open Spaces and Reserves , Regulatory Services Group, Corporate Services,
- Team Leaders (Works Supervisors)
- Roadside maintenance contractors
- Council Copy for elected members
- Display copy within council office for public viewing
- Government Departments – North Coast Catchment Management Authority), Office of Environment and Heritage, (NPWS, Alstonville and Coffs Harbour), Land and Property Management Authority, Roads and Maritime Services, Trade and Investment,
- Utility providers – Essential Energy, Rous Water,Telstra
- EnviTE Environmental Training and Education
- Jali Local Aboriginal Land Council
- An electronic copy be placed on Council's website

Map of study area

1.4 Aims and Objectives

Aim

The aim of this Plan is "***To provide an operational plan that guides all stakeholders in the conservation of the genetic diversity of Ballina Shire's roadside ecosystems, through balanced management that recognises the needs and desires of the roadways many users.***

Objectives

The objectives of the Ballina Roadside Vegetation Management Plan are to:

1. Provide a document that meets the legal requirements for both the provision and maintenance of a safe road network and the protection of roadside vegetation;
2. Develop an easily accessible data base of roadside vegetation for the Ballina Shire area based on the data collected in the Ballina Roadside Vegetation Survey;
3. Provide a practical guideline for the sustainable management of rural roadside vegetation that achieves a balance between roadside biodiversity conservation and safe community access;
4. Protect high conservation value native vegetation, threatened flora and fauna species and cultural heritage sites within the road reserve;
5. Identify and prioritise roadside vegetation management actions that progressively revegetate roadsides where this will not interfere with carriageway safety;
6. Assist in the education, training and involvement of the road maintenance staff and the community in roadside biodiversity management; and
7. Promote community and employee awareness of the importance of roadside vegetation.

1.5 Methodology

The preparation of the Ballina Roadside Vegetation Management Plan involved:

a) A survey of Ballina Shire's roadside vegetation, the Ballina Roadside Vegetation Survey (BRVS)
b) Production of the Ballina Roadside Vegetation Management Plan (BRVMP) and associated documentation:
c) Internal Review of the plan
d) Distribution to stakeholders

1.5.1 The Ballina Roadside Vegetation Survey (BRVS)

In late 2005 Environmental Training and Employment (EnviTE) conducted an extensive roadside vegetation survey of over 400 kilometres of Ballina Shire's roads with a speed limit above 60 kilometres/hour. The survey results were captured digitally as 'areal data' Polygon shape-files for lengths of roadside and a file of recorded points identifying feature locations more accurately.

The survey captured 1378 polygon shape files. The length of the polygon determined by a roadside sector demonstrating uniform attributes. The attributes recorded included native plant species present, weed species, vegetation community, vegetation condition, presence of

threatened species, significant vegetation features and threats. Each polygon was allocated a '***vegetation management treatment'*** category based on these attributes.

Data for 291 'points' identified the exact location of threatened species, heritage items such as stone walls, buildings, planted trees, habitat features such as soaks and seepages, understory thickets, dense litter and isolated significant trees.

The results of the survey are stored on Ballina Shire Councils GIS database (MapInfo).The survey's findings are summarised in the document *Draft Ballina Roadside Vegetation Survey* (EnviTE 2006). Summaries of the results of the survey appear throughout this document.

The BRVS is limited in its scope in that:

- The survey was only a 'snap shot', influenced by seasonal timing, prevailing climatic conditions. These conditions determine the presence of annuals and ground plants such as forbs, herbs and orchids. Available funding and resources imposed physical limitations and the area covered;
- Rarity making Threatened Species hard to identify;
- Only superficial assessment of the main type of vegetation; and
- Discrepancies in the naming of vegetation 'formations', 'sub-formations and 'communities' between the BRVS and the Ballina Shire Vegetation mapping.

1.5.2 The Ballina Roadside Vegetation Management Plan (BRVMP)

The preparation of the BRVMP involved a review of literature on roadside vegetation management, consultation with stakeholders and interpretation of the BRVS. The BRVMP and Field Kit were produced by a contractor with the assistance of Council staff in particular the GIS unit. The plan contains background information, guidelines, interpretation of survey data and recommendation for future works.

(i) Consultation

Consultation was undertaken during the preparation of the Plan with Council staff, Government Departments - Roads and Transport Authority (Roadside Environmental Committee), Northern Rivers Catchment Management Authority, Dept of Environment and Conservation, Dept of Natural Resources, State Forests of NSW, State Emergency Services, Rural Lands Protection Board, Dept of Primary Industries, service providers (Essential Energy, Telstra and Rous Water) and the community. (Note : Departmental and organisation names have changed since the consultation took place. See Appendix 11)

The Jali Local Aboriginal Land Council and Council's Aboriginal Liaison Officer Darrell Creighton were consulted in regard to the most appropriate process to identify and protect significant Aboriginal sites with the road reserve. Access to the AHIMS data under restricted licence for the Shire area was provided by the Department of Environment, Conservation and Climate Change (DECC). A site visit of identified sites was conducted in December 2006 with representatives from the Jali Aboriginal Land Council, DECC sites officer and BSC's Aboriginal Liaison Officer.

(ii) Internal review

The Plan was distributed within Council to Civil Services, Regulatory Services, Strategic Planning and Councillors. The Plan will be reviewed based on field testing.

(iii) Implementation

Actions for the implementation of the Plan are detailed in section 4 (p45). Actions are to be implemented in line with the guidelines for Integrated Roadside Vegetation Management (See Appendix 1).

Implementation will be administered by Engineering Works Unit through the Maintenance Engineer and the Team Leader Road Maintenance. Open Spaces and Reserves Unit may assist with bush regeneration, 'active management' of significant native vegetation sites, less intrusive 'vegetation treatments' and in building the skill and knowledge base of maintenance staff in identifying plant and vegetation communities and appreciating their value.

(iv) Review of the Plan

It is recommended that the results 'vegetation treatment' categories be continuously reviewed. GIS data be updated throughout the life of the Plan. Data relevant to changes in vegetation condition, vegetation communities, age etc for polygons be updated as information becomes available.

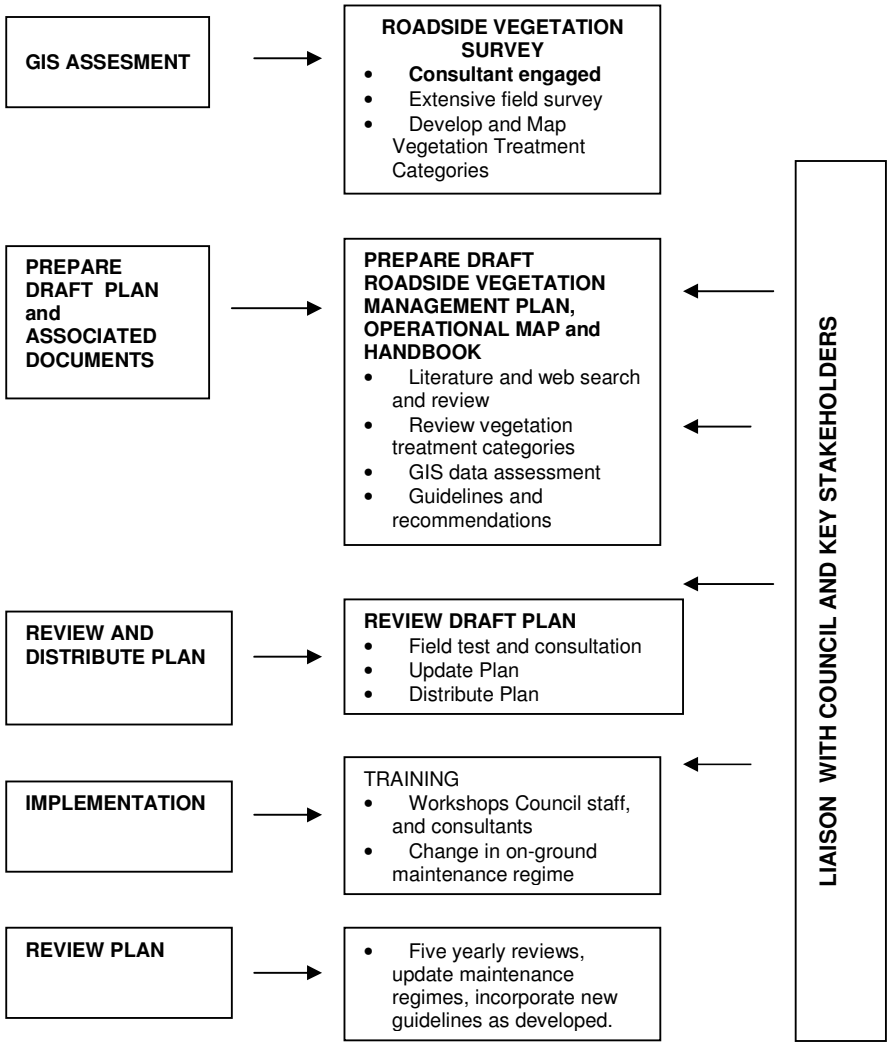
The Plan be reviewed and updated on a 5 year basis.

(v) Future updates to the Plan

Updates of the plan and its implementation would benefit from the following:

- A review of the classification of 'vegetation communities' used in the Ballina Roadside Survey (EnviTE 2006) so they are in agreement with the vegetation communities used in the Ballina Shire Vegetation Mapping. This may require addition survey work and/or a reassessment of the vegetation communities;
- A survey of forbs and ground plant species;
- Review of changes in relevant legislation;
- Observations on the condition of vegetation on 'unformed roads' and public lands adjacent to the road reserve;
- Cooperation between neighbouring Council's to establish a uniform approach to roadside vegetation management. For example (i) standardisation in the format of Vegetation Management Plans, (ii) use of the same classification of vegetation communities, '(iii) standardised assessment of monitoring and evaluation for changes in vegetation condition and (iv) common vegetation treatments' for roadside maintenance;
- Cooperation with the Roads and Maritime Services (RMS) on collection of data and management options along the roads under RMS management within the Shire e.g. the Pacific and Bruxner Highways: and
- Incorporating updates of Regional and State vegetation management guidelines such as those originating from the Roads and Maritime Services (RMS) - Roadside Environment Committee and the Northern Rivers Catchment Management Authority.

FIGURE 1 : ROADSIDE VEGETATION MANAGEMENT PLAN METHODOLOGY



1.6 Links to other plans and studies

The management guidelines in this document incorporate material from the following documents,

Roadside Vegetation Management - NSW RTA Guidelines, (Roads and Traffic Authority (NSW) 1998, 2004a, 2004 b), roadside vegetation plans prepared by Country Energy and other Local Governments, including North Coast NSW Councils – (Lismore Operational Plan Roadside Vegetation Management, 2005, Roadside Vegetation Management Plan Kyogle Council, 2002 and Bellingen Shire Roadside Management Plan, 1998) and material available on the internet.

Environmental guidelines for roadside maintenance and construction in : ARRB Transport Research, (2000). *Unsealed Roads Manual: Guidelines to Practice,* ARRB Transport Research, (2005). *Sealed Local Roads Manual: Guidelines to Good Practice* and Northern Rivers Catchment Management Authority (2007) *NRCMA Region LGA Rural Roads and Roadsides Land Management Strategic Plan.* NRCMA

2. THE ROADSIDE ENVIRONMENT

2.1 Roadsides and their Importance

Roads provide a thoroughfare for the movement of people and materials through an area and legal access to properties. Roads contain sites for locating utility service facilities such as electricity, water and telephone, community recreational and scenic value and play a role in the management of fire. More recently roadsides have been recognised for the valuable role they play in supporting remaining native vegetation and the biodiversity of an area.

2.2 Roadside Classifications

Ballina Shire contains sealed roads**,** unsealed roads and unformed roads. From an engineering perspective Ballina's road network is classified into categories based on functional use taking into account specific traffic needs. The categories include ***Highways*** (Pacific and Bruxner Highways), ***'Arterial Roads'*** e.g. Angels Beach Drive, The Coast Road, ***Sub-Arterial Roads (Rural)*** Rifle Range Road, Tuckombil Road, Teven Road, North Teven Road, Ross Lane, and ***Collector Streets***, (Ballina Road Network Study, 2000 Eppell Olsen and Partners 2000). A road may also be classified as providing access to through traffic, local traffic or limited local traffic. Some roads are known to be used on a regular basis by larger vehicles such as sugar cane trucks or school buses. These classifications influence the clearances required for visual safety and hence determine the maintenance regimes imposed.

In addition to formed roads there is a network of Council administered designated road reserves with no existing roads or 'unformed roads'. This land is often managed by private landholders. Roads may be constructed in some of these reserves in the future, but there are a large number of sites on which it is unlikely roads will ever be constructed. These road reserve sites are not included in the scope of this Plan. A number of these reserves are in the process of being sold by the Land and Property Management Authority. They may contain significant stands of native vegetation and future surveys are desirable.

2.3 The Roadside Management Zone

The 'roadside management' zone assessed in the road survey and referred to in this plan generally extends to a visual marker such as the fence line of the neighbouring property. The area subject to routine roadside maintenance usually consists of slashing and/or sidearm mowing to within 2.5 metres of the road seal or 1m outside the table drain or road shoulder and patrol grading for gravel roads. Whilst usually a relatively narrow linear strip adjacent to the carriage-way road reserve easements may at times cover a considerable area for example in and around intersections. These Road Reserve areas are identified on Councils GIS system mapping under the 'Roads and Bridges' data layer.

The BRVS divides the rural roadside into 1378 roadside sectors. The length of the sector is determined by that area containing a uniform set of attributes. For roadside maintenance purposes a ***'vegetation treatment'*** category is allocated for each sector. A treatment profile is prescribed for each 'vegetation treatment' category (See section 3.5 for details).

2.4 Roadside Vegetation

Ballina Shire's climate, geographic location, diverse topography, soils and terrain creates an environment that supports a rich and unique biodiversity. The native flora of the Upper North Coast of NSW is amongst the most diverse in Australia. Native vegetation communities in the Shire include rainforest, wet and dry sclerophyll forest, (woodland and open woodland), heath and wetlands. A large percentage of the original vegetation has been cleared especially on the Richmond floodplain now extensively used for sugarcane production and on the Alstonville Plateau for agricultural pursuits and more recently for urban and rural residential development.

The BRVS identified "*considerable vegetation diversity and habitat value on roadsides"*. Significant remnants and regrowth of the original native vegetation are present as clumps, lineal strips and individual trees. Native roadside vegetation is found along fence lines, on road batters and on sites difficult to access by maintenance machinery. Germination of native seeds even under dense weed canopies indicates a level of natural resilience, showing *potential for rehabilitation.*

2.4.1 Vegetation Communities

Using a classification system based on the dominant species present in the upper canopy the BRVS recorded one hundred and six (106) different vegetation communities. As a result of major modification of roadside verges the most common roadside vegetation community is grassland, mainly exotic grass species, Other common communities include rainforest re-growth, 'Sclerophyll forest' (Open or Eucalypt forest), heath, and *Melaleuca* wetlands.

Table 1 : Vegetation Communities found in the Ballina Road Reserves.
(based on data from the Ballina Roadside Vegetation Survey (EnviTE 2006))

Broad Vegetation Type (Common name)	**Representative Vegetation Communities**
Agriculture / Grassland	Agriculture / Grassland
Rainforest (Closed forest)	Mixed rainforest, *Araucaria, Guioa,*
Sclerophyll Forest	Eucalyptus species, Casuarina,
Heath	Callitris, Banksias spp, *Acacia sophorae*,
Wetland (Melaleuca and Mangroves)	*Melaleuca quinquenervia,* Saltmarsh, *Typha*, *Baumea*, *Juncus*, *Phragmites,*
Plantings / gardens	Mixed garden plantings
Weeds	Camphor Laurel, Lantana, *Pinus elliotti,*
Mixed re-growth	

See Appendix 4 for additional detail

Vegetation Community	**No. of Sectors**
Agricultural / Grasses	438
Guioa semiglauca, Cupaniopsis anacardioides	143
Mixed Garden Plantings	125
Eucalyptus spp	115
Lantana camara	41
Camphor Laurel and Rainforest spp	38
Eucalyptus pilularis and Lophostemon confertus	33
Camphor Laurel + 20-50% Rainforest+Privet	28
Avicennia marina, Aegiceras corniculatum	24
Lantana camara, Commersonia bartramia	23
Mixed Rainforest Regrowth with Camphor	22
Melaleuca quinquenervia, Casuarina glauca	21
Eucalyptus robusta, M quinquenervia	20

Vegetation Community	**No. of Sectors**
Melaleuca quinquenervia	18
Eucalyptus carnea, Eucalyptus acmenoides, Eucalyptus resinifera, Eucalyptus intermedia	16
Casuarina glauca	16
Rainforest spp and Camphor Laurel	16
Lophostemon confertus	14
Cinnamomum camphora and Rainforest spp	14
Mixed Rainforest Regrowth	14
Avicennia marina and Casuarina glauca	12
Melaleuca quinquenervia	11
Lophostemon confertus, Melaleuca quinquenervia and hard Corkwood	10
Phragmites australis	10

Table 2; Vegetation Formations found in the Ballina Road Reserve.

Based on the Ballina Roadside Vegetation Survey – Community (Vegetation) category

VEGETATION FORMATION	VEGETATION SUB-FORMATION	SECTORS	TOTAL SECTORS
Forest and Woodland	Blackwood regrowth	2	215
	Dry Sclerophyll Forest and Woodland	16	
	Dry Sclerophyll, Mallee Forest and Woodland	3	
	Forest	4	
	Highly Disturbed Woodland	1	
	Low open Forest	1	
	Mixed Forest	4	
	Swamp Sclerophyll Forest and Woodland	88	
	Swamp Sclerophyll Shrubland	11	
	Swamp Sclerophyll / Swamp Sclerophyll Forest and Woodland	2	
	Tall/Closed Forest	75	
	Woodland	8	
Heathland	Dry Heathland	6	19
	Wet heathland	13	
Mangroves	Mangrove Complex, Mangrove shrubland	44	44
Rainforest	Isolated Rainforest Tree	6	340
	Littoral Rainforest	9	
	Lowland Subtropical Rainforest	6	
	Subtropical Rainforest	319	
Scrubland (scrub)	Closed Scrubland	3	16
	Dry Sclerophyll Forest	4	
	Foredune complex	2	
	Mixed Regrowth	1	
	Dry Sclerophyll Shrubland	1	
	Swamp/wet Sclerophyll Shrubland, Dry Sclerophyll Shrubla	5	
Tall Closed Grassland	Tall Closed Grassland	10	10
Windbreak	Dry Sclerophyll windbreak	115	115
Non-native community (grasses, agriculture)	Non- native sub-formation (grasses, agriculture)	438	439
	Palm	1	
Garden Plantings	Mixed Garden Plantings	125	125
Weed dominated	Camphor Laurel with Mixed Rainforest Regrowth	7	51
	*Lantana camara** (Lantan)	41	
	*Pinus elliottii** (Slash Pine)	3	
Isolated trees	Isolated Tree	4	4
TOTAL SECTORS			**1378**

Endangered Ecological Communities* (EEC)

with potential to occur in Ballina Shire

The definition of endangered ecological communities as prescribed by the Act is unclear in respect to condition and size. For example an unofficial definition of rainforest may be "Two or more rainforest species forming a canopy". The relationship to value may be assessed by the 7 Part Test *(section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act).*

The following plant communities which may occur in Ballina Shire are listed under Part 3 of the Threatened Species Conservation Act (TSCA) 1995 as Endangered Ecological Communities. As described in the final determination of the Scientific Committee to list the ecological community.

Coastal Cypress Pine Forest in the NSW North Coast Bioregion

Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion

Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Note: Other communities may be declared during the life of the plan.

The Ballina Roadside Vegetation Survey (EnviTE 2006) identified at least 336 roadside sectors supporting vegetation communities which may fall into the above EEC categories.

The final determination of which roadside sites support vegetation classified as an Endangered Ecological Community will require further investigation.

2.4.2 Roadside Vegetation Condition (Categories)

The condition of vegetation plays a major role in habitat value, the sustainability of the vegetation and the potential or ease of rehabilitation. The BRVS (Envite 2006) categorised 'vegetation condition' into seven classes from the worst "Weed dominated, native trees absent or dead" (Class 1) to the best "Pristine, forest or system self sustained" (Class 7).

Table 3 : Ballina Roadside Vegetation Condition Classes

Class	Vegetation Condition	No of Sectors
7	Pristine, forest or system self sustaining, needs no assistance	0
6	Vegetation in good order, sporadic weeds	3
5	Has structure of original vegetation type with a number of stratums, healthy but threatened by encroaching weeds	15
4	Has structure of forest or original vegetation type with heavy weed but some natural regeneration	146
3	Has structure of forest or original vegetation type with heavy weed infestation leading to rapid decline	309
2	Weed dominated with a few emergent native trees and shrubs	440
1	Weed dominated, native trees absent or dead	465

The majority of roadside vegetation has lost its original structure or is heavily weed infested. Vegetation communities adapted to low nutrient conditions such as heath, eucalypt forest and melaleuca wetland were observed to be in the better condition. Rainforest and riparian vegetation communities were generally more weed infested and in poorer condition.

No sector was identified as condition 'Class 7'. Condition 'Class 6' sectors are found at (1) Pearces Creek, Alstonvale, (2) The Gap Road Alstonville and (3) Bagotville Road, Bagotville. Longer lengths of valuable native vegetation in Condition 'Class 4 and 5' are found along sections of Coolgardie Road, Forest Road, Uralba Road, Fernleigh Road, Baggotville Road and Old Baggotville Road.

The number and density of native species found in the understory is a valuable indicator of natural resilience and the potential for rehabilitation.The presence of understory species appeared dependent largely on the level of disturbance by regular maintenance. The fire frequency and grazing history of a site may influence the condition and extent of a native understory.

Note

Most roadside vegetation management plans allocate a **"roadside vegetation condition category" (RVCC)** to sectors of roadside. Usually one of three RVCCs (e.g. A = 'Conservation', B = 'High potential for Recovery', C = 'Highly Modified') as prescribed by the RMS is allocated to each sector. Permissible activities and maintenance regimes are then prescribed for each category of RVCC.

The attributes in the BRVMP that most closely aligned to a RVCC is the '*vegetation condition*'. For the sake of conformity with the RMS recommendations and other plans Ballina Shire's roadside section may be placed into a three tier vegetation category based on 'Vegetation Condition' as per the table above. Condition Class 5&6 = A Conservation, Condition Class 3&4 = 'Conservation' B = 'Condition Class 1&2 = Conservation C

2.4.3 Threatened Species

Seven different species of threatened plants, listed as either 'vulnerable' or 'endangered' under the *Threatened Species Conservation Act (1995)* were identified at sixty locations. (EnviTE 2006). Threatened species occur as single specimens in the understory of weed species such as Camphor Laurel or in 'relative abundance' ('hot spots') along sections of Fernleigh Road -Tintenbar, Old Bangalow Road - Tintenbar, Friday Hut Road - Tintenbar, Coolgardie Road - Coolgardie and Teven Road - Tuckombil.

Fewer threatened species were found in Ballina Shire roadsides than in adjacent Lismore and Kyogle Council roadside surveys. These Shires' lands areas are significantly larger.

Whilst the roadside survey (EnviTE 2006) attempted to be comprehensive resource limitations may have resulted in ***threatened species present not being mapped.*** Threatened forbs and ground plants such as orchids are difficult to detect. It is recommended that:

- Further surveys and regular reviews of the vegetation mapping be undertaken; and
- Road maintenance staff train in threatened species identification.

Threatened Plant Species recorded within the Ballina Roadsides

SPECIES	FORM	TSC STATUS	No. SITES	COMMUNITY
Archidendron hendersonii (White Laceflower)	Tree	Vulnerable	3	Rainforest
Geijera paniculata (Axe breaker)	Tree	Endangered	1	Rainforest
Lepiderema pulchella (Fine leaved Tuckeroo)	Tree	Vulnerable	1	Rainforest
Macadamia tetraphylla (Rough shelled bushnut)	Tree	Vulnerable (EPBC)	44	Rainforest
Syzygium moorei (Durobby, Coolamon)	Tree	Vulnerable	2	Rainforest
Syzygium hodgkinsoniae (Red Lilly Pilly)	Tree	Vulnerable	1	Rainforest
Tinospora tinosporoides (Arrowhead Vine)	Vine	Vulnerable	8	Rainforest

See Appendix 6 for details

Table 4 : Locations of Threatened Species on Ballina Roadsides

Botanical Name	Street	UID	Location
Archidendron hendersonii **White Lace Flower**	Old Bangalow Rd, Tintenbar	250, 252	On west side (creek side), past 90 degree corner, 375 & 1100 metres
	Sandy Flat Road, Cumbalum	191	400 metres from Pacific Hwy, south side of road
Geijera paniculata **Axe breaker**	120 Coolgardie Road, Coolgardie	132	860 metres from Pacific Hwy, east side of road
Lepiderema pulchella **Fine leaved Tuckeroo**	Pathway, Alstonville	152	In front of Alstonville High School
Macadamia tetraphylla **Queensland Nut**	114-116 Bartletts Lane, Meerschaum Vale	114	1140m from Wardell Rd, 300m past corner, east side rd
	Chesworth Lane, Wollongbar	98	on corner 600 m from Lindendale Rd, south side of road
	Coolgardie Road, Coolgardie	136	860 metres from Pacific Hwy, west side of road
	Coolgardie Road, Coolgardie	137	250 metres from Pacific Hwy, north side of road
	Crawfords Lane, Rous Mill	232	860 metres from Marom Creek Rd, on west side of road
	Dalwood Road (660), Rous	161, 162, 167	540 metres north Laws Lane, east side and 400m north side)& 740 meters south side of road past Ellis Road
	6 East Street , Tintenbar	2	Macadamia in adjoining paddock
	153, to 298 Fernleigh Road, Fernleigh to Tintenbar	46,49 -51 62 64 - ,67	Several sites north-west of Tintenbar Oval on west side of road. to near Majors Road
	Friday Hut Road, Tintenbar	42, 45	(42) 800 metres south of Killen Falls Drive and (45) 570 metres south of Emigrant Creek Crossing, east side road
	Gallans Road, Ballina	215	550 metres from Pacific Hwy, east side of road
	Hermans Lene, Pimlico	129	630 metres from Perrys Lane, north side of road
	216 Houghlahans Creek Road , Teven	201, 204	150 & 220 metres north of third causeway (creek crossing), east side of road
	Ingrams Road, Cumbalum	212	160 metres from Cumbalum Road, north side
	Kirklands Lane, Fernleigh	106	1250 metres from Nashua Road, south side of road
	411 Marom Creek Road , Meerschaum Vale	118, 121	130 metres east of Justelius Road corner, east side of road
	North Creek Road, Skennars Head	256	400 metres south sewerage works road, north-west side rd
	287 North Teven Road, Teven	198	350 metres Tintenbar Road, north-east side road
	Old Bangalow Road, Tintenbar	249, 251	On west side of road (creek side), past 90 degree corner, 300m & 950 metres
	Teven Road (953-955), Tuckombil	68 -70, 72	Number of sites from 270 metres to 550 metres + north east of Shaws Lane, on north side of road
	Teven Road, Teven	8	Corner Eltham and Teven Road, on creek side
	Tintenbar Road, Tintenbar	80, 193	On bank, north of road opposite George St
	9 Tuckombil Lane, Tintenbar	16,17	North -east corner Teven Road and Tuckombil Lane
	Victoria Park Lane, Dalwood	185 -187	East side of road in Victoria Park Nature reserve edge
Syzygium hodgkinsoniae **Red Lilly Pilly**	22 East Street, Tintenbar	1	100 metres from Pacific Hwy on south side of road
Syzygium moorei **Durobby**	146 Forest Road , Uralba	179	1300 metres from Uralba Road, on east side of road
	110 Platypus Drive, Uralba	180	900 metres from Uralba Road, west side of road
Tinospora tinosporoides **Arrowhead Vine**	Amber Place, Meerschaum Vale	113	270 metres from Wardell Road, south side of road
	Byrnes Lane , Tuckombil	27, 28	700 metre from Tuckombil Road, east side of road
	Fernleigh Road, Brooklet	58	900 metres west Friday Hut Road, south side of road
	Tintenbar Road, Tintenbar	79, 81	On bank, north side of road opposite George St
	Tuckombil Road, Tuckombil	25	300 metres east of Teven Road corner, north side of road
	Wardell Road, Dalwood	264	300 ++ metres from crest south side of Alstonville cutting

See Appendix 6 for additional information on Threatened Species

2.4.4 Weeds

Weeds are plants growing where they are not wanted. 'Declared noxious weed' species and a large number of environmental weed species are found along Ballina Shires roadsides. Weeds were identified 'as a major threat to the viability of roadside native vegetation' (EnviTE 2006). Roadways may act as an avenue for the spread of weeds. In some situations road verges are a major source of potential weed infestation for surrounding agricultural land. Vegetation management along roadways needs to consider the impact on the spread of noxious and environmental weeds.

'Noxious weeds' are plant species proclaimed by Order of the Minister for Agriculture under the Noxious Weed Act (1993). There is a legal requirement on landowners to control these weeds once declared. (See Appendix 7 for 'Noxious Weed' listings). Declared Noxious weeds were identified at only a few locations, possibly an indication that the local noxious weed control authority, Far North Coast Weeds, have been active in roadside weed management.

In addition to declared 'noxious weeds' a large number of environmental weeds, plants that have become problems by intermixing with native plants, invading and altering native plant communities, are found on roadsides (EnviTE 2006). Weeds include exotic grasses and herbs, annuals, invasive groundcovers that spread through desiccation by slashing (e.g. Wandering Jew), shrubs and trees and aggressive vines dispersed though seeds, propagules or desiccation. On many sites weeds are present as saplings or juvenile trees that may be controlled prior to growing into larger specimens, providing considerable long term savings.

The major tree and shrub weeds include Camphor Laurel (*Cinnamonum camphora*), Lantana (*Lantana camara*), Small and Large-leaved Privet (*Ligustrum sinese* and *L. lucidium*). These weeds are so widely spread that short term control is highly improbable. Aggressive vines such as Madeira Vine (*Anredera cordifolia),* Cats Claw Creeper (*Macfadyena unguis-cati*) and Climbing Asparagus (*Asparagus plumosus*) occurred in small but apparently spreading outbreaks. Exotic annuals and grasses are widely distributed.

A number of "Sleeper weeds" species present in small numbers but with potential for rapid future spread were also identified See Appendix 7.

Currently weed control other than for road safety is a minimum component of the roadside vegetation management regime. Additional resources are required for Council to undertake environmental weed control for conservation purposes.

See Appendix 7 for species lists of noxious weeds and environmental weeds and Appendix 14 for weed profiles and management techniques.

See Fact Sheet 2 Roadside Weed Management Guidelines for Ballina Shire Roadsides for additional notes on weed control techniques.

Table 5 : Common Weeds found on Ballina Roadsides ranked by occurrence.

Information source Ballina Roadside Vegetation Survey (EnviTE 2006) 1378 Polygons / sectors

WS 1 = Weed Sp 1, Main weed found in polygon sector,
WS 2 = Weed Sp 2, Secondary weed found in polygon sector,
WS 3 = Weed Sp3. Tertiary weed found in polygon sector

NCW * Threat Ranking : North Coast Weeds Environmental Weed Task Force 2000
Rank based on a list of the 187 weeds as having, or with the potential to have, a significant impact on native vegetation on the NSW North Coast was compiled by the NSW North Coast Weed Advisory Committee's Environmental Weed Taskforce. Rank 1 poses the greatest threat.

Botanical Name	Common Name	No. of Sectors				Rank
		WS1	WS 2	WS 3	Total	NCW
Cinnamomum camphora	Camphor Laurel	429	171	114	714	4
Lantana camara	Lantana	226	251	169	646	10
Ipomoea cairica	Five-leaved Morning Glory	72	51	59	182	23
Ligustrum sinense	Small-leaved privet	29	61	84	174	2
Ligustrum lucidum	Large –leaved privet	17	97	41	155	6
Ochna serrulata	Ochna, Mickey Mouse Plant	29	32	27	88	24
Setaria sphacelata	Setaria	17	30	32	79	68
Erythrina X sykseii	Coral Tree	31	23	20	74	71
Melinis minutiflora	Molasses Grass	16	24	30	70	98
Anredera cordifolia	Madeira Vine	26	17	15	58	1
Ageratum houstonianum	Blue Billy Goat Weed	8	17	33	58	56
Ageratina adenophora	Crofton Weed	7	17	33	57	44
Schefflera actinophylla	Umbrella Tree	23	10	21	54	14
Passiflora subpeltata	White Passionfruit	5	16	32	53	63
Ageratina riparia	Mist Weed	6	20	26	52	30
Senna pendula var. glabrata	Winter Senna	8	21	15	44	27
Paspalum urvillei	Paspalum	5	17	22	44	104
Pinus ellioti	Slash Pine	17	19	6	42	45
Asparagus aethiopicus	Ground Asparagus	14	12	12	38	11
Chrysanthemoides monilifera	Bitou Bush	10	18	8	36	20
Melinis repens	Rose natal Grass	8	9	13	30	
Asparagus africanus	Climbing Asparagus	16	7	6	29	21

2.5 Other Roadside Attributes

In addition to vegetation the BRVS (EnviTE 2006) identified other roadside attributes including heritage sites.

Heritage sites

Post European Settlement Heritage Sites
The BRVS identified the following heritage items within the Ballina Shire road reserve. This list has been forward to the 'Draft Ballina Shire Wide Community Based Heritage Study' for consideration for future heritage listing and conservation management.

Table 6 : Heritage Features in Ballina Shire's Road Reserve

Feature	UID *	Street	Locality
Bunya pines historic planting	7	Eltham Rd	Teven
Creek	33	Friday Hut Rd/Skinners Ck	Brooklet
Fig trees - old planted	107	46 Kirklands Lane	Fernleigh
Historic (Old) home	232	Crawfords Ln	Rous Mill
Historic hall	11	Pearces Creek Hall Rd	Pearces Creek
Historical home	234	Crawfords Ln	Rous Mill
Planted tree	152	Pathway	Alstonville
Podocarpus - Largest seen	158	Wardell Rd	Alstonville
School - old building	87	Cowlong Rd	Mcleans Ridges
Stone wall	9	Houghlahans Creek Rd	Pearces Creek
Stone wall	26	127 Tuckombil Rd	Tuckombil
Stone wall	48	Fernleigh Rd	Tintenbar
Stone wall	142	51 Old Byron Bay Rd	Newrybar
Stone wall	189	235 Sandy Flat Rd	Cumbalum
Stone wall	195	Fredericks Ln	Tintenbar
Stone wall	196	28 Fredericks Lane	Tintenbar
Stone wall - good example	10	Houghlahans Creek Rd	Pearces Creek
Tinospora (extensive stand)	25	Tuckombil Rd	Tuckombil
	186	Victoria Park Lane	Dalwood

* UID = Unique identifier number for roadside point data in EnviTE 2006 database

Indigenous Heritage Sites

An archaeological survey has not been conducted for the majority of road reserves. It is highly likely that significant aboriginal activity occurred on sites now covered by roadways and that these sites have been disturbed by construction and maintenance events. Local Aboriginal community groups strongly support the preservation and protection of all archaeological sites that are identified. These places demonstrate that Aboriginal people have occupied the land long before non-Aboriginal people settled this area. Vandalism and/or destruction to heritage sites is a serious problem for Aboriginal community members, causing loss of history. Damaging Aboriginal heritage sites is an offence under the National Parks and Wildlife Act 1974.

An inspection of sites registered on the Aboriginal Heritage Information Management System (AHIMS) in Ballina Shire road reserves was conducted on 3 November 2006 with the Department of Environment and Conservation, Aboriginal Sites Officer and a Jali Aboriginal Sites officer. At the time of the survey no significant sites were identified as being impacted by roadside maintenance activities.

2.6 The Value of Roadside Vegetation

The value of roadside vegetation is increasingly being recognised and appreciated.

The values of roadside vegetation include:

1. As reserves for native vegetation. This vegetation may act as a corridor between otherwise isolated native vegetation stands, linking different native vegetation communities;
2. Providing habitat for a variety of native animals, an important refuges for feeding shelter and breeding;
3. Habitat for 'threatened' native plant and animal species listed under the *Threatened Species Conservation Act (1995);*
4. Playing a significant role in soil conservation and storm water quality. In areas of high and frequent heavy rain, vegetation particularly groundcovers such as introduced grasses may protect the soil eroding on the road shoulder and in table drains. Vegetation acts as filter strips for sediment and pollutants from road run-off such as petrochemicals, improving water quality entering watercourses;
5. Public amenity, roadside vegetation may be a prominent part of the landscape. Trees and shrubs provide a shelter from road noise, dust and prevailing winds and shade for adjacent landholders;
6. As a source of readily accessible native seed stock used for restoration works;
7. Acting as effective means of weed control. Well managed native vegetation reduces weed maintenance needs;
8. Sites that may contain items of Aboriginal and non - aboriginal heritage significance. Many roads are located along pre-existing traditional pathways; and
9. Adding value to tourism through provision of attractive roadsides, shady drives etc.

The value of the roadside vegetation is dependent on the context it plays in relation to the surrounding environment. Roadside vegetation may be the edge of a larger remnant on adjoining land or a thin strip of vegetation surrounded by a highly modified environment like exotic grass pasture, monoculture crops or garden plantings.

3. MANAGING ROADSIDE VEGETATION

This section identifies the key processes influencing the quality and extent of roadside vegetation and outlines guidelines for a roadside vegetation maintenance regime.

3.1 Key Influencing Processes

Roadside maintenance impacts on the roadside environment. Impacts include damage or loss of native vegetation (including threatened species) and associated habitat, the introduction and dispersal of weeds, injury to wildlife, disturbance of heritage objects, increased erosion and impacts from the use of herbicides. Impacts on vegetation may be indirect such as through increased soil erosion. Due to the linear nature of most roadside vegetation, habitat value and remnant viability are rapidly lost if threatening processes are present.

The key influencing processes on roadside vegetation are:

- Disturbance and Edge Effect, Disturbance is the main threatening process to roadside vegetation. Major causes of disturbance include the removal of vegetation, the movement, exposure or compaction of soil, fire management and grazing.

  Disturbance tends to increases the "edge effect" associated with areas of vegetation. The term "Edge Effect" describes the changes in environmental conditions such as light, drainage, wind exposure, which occur when a new edge is created at the boundary of a vegetated area.
- Habitat Loss, occurs through the removal of material such as trees and dead wood, regular burning, slashing and soil compaction. Habitat loss can occur slowly, gradually eroding the habitat value of roadsides.
- Weed Infestation, exotic plants compete with native species for available resources and alter environmental conditions favourable for native growth. Disturbance of native vegetation is often the major cause of weed infestation.
- Soil Erosion, impacts on roadside vegetation by scouring soil from existing plants and burying seedlings. Soil erosion often occurs after major disturbance events such as road construction and/or maintenance or the removal of ground covering vegetation.

3.1 a. Main causes of influencing processes.

The main causes of these key influencing processes are:

- Management activities such as road construction and maintenance works and roadside maintenance;
- Other human activities within the road reserves;
- Off site impacts - activities on land adjoining the road reserve that impact on the road reserve area e.g spray drift, sediment run off; and
- Roadside management practices that increase the extent and quality of roadside vegetation including Environmentally friendly maintenance regimes and active rehabilitation.

The main agents of these influencing processes in Ballina Shire include:

- Road construction and repairs and associated activities (including stockpiling);
- Roadside maintenance (including slashing, side-arm mowing, chemical weed control, grading);
- Infrastructure installation and maintenance;
- and Erosion (sediment) control.

'Minor' activities impacting on roadside vegetation include:

- Fire management;
- Roadside grazing and pest animals;
- Firewood collection and harvesting timber;
- Waste and litter control;
- Seed collection and wild flower harvesting;
- Collection of rocks, soil and sand;
- Roadside planting by Council and/or neighbours of inappropriate species;
- Existing roadside plantings of native species; and
- Vegetative waste dumping and turnaround areas.

3.1.b. Off-site Impacts

Factors originating from land-use outside the road reserve may impact on the vegetation within the road reserve. These include:

- Rural sub-division resulting in high density residential development and an increase in urban and rural interface;
- Non native nurseries acting as a source of propagules of weed species;
- Neighbouring gardens harbouring plant species with potential for spread;
- Herbicide and chemical drift from agricultural activities; and
- Stormwater run-off from adjoining land.

Appendix 8 provides a summary of these issues and guidelines for best management practices to reduce the environment impact of roadside activities..

3.2 Sites Requiring Specific Management Considerations

Roads may pass through sites with characteristics that require specific management considerations when works are conducted in their vicinity. For example:

- Wetlands;
- Weed control in drains and adjacent to water bodies such as streams and lakes, require the use of registered aquatic herbicide
- Acid Sulphate Soils sites;
- Sites subject to flooding;
- Sites impacted by tidal influence; and
- 'Herbicide sensitive' sites.

3.3 Current Ballina Shire Roadside Management

Balllina Council is the direct authority responsible for the maintenance of the roads and roadsides network within Ballina Shire except for the Pacific and Bruxner Highways. Council base their road construction and maintenance work environmental management procedures on guidelines from the following publications:

- The *Environmental Handbook for Routine Maintenance Works (*Roads and Traffic Authority NSW). Points on avoiding damage to flora and fauna pp. 24-25;
- *Sealed Local Roads Manual: Guidelines to Good Practice (*ARRB Transport Research 2005). Section 23. contains environmental requirements for project site management, rehabilitation and clean up', Section 27.9 lists guidelines for the preparation of Environmental Management Plans (EMP) and the need for "Environmental Risk Assessment to be embedded into the delivery of roadside maintenance works", Section 31 provides brief guidelines for roadside maintenance; and
- *Unsealed Roads Manual: Guidelines to Practice (*ARRB Transport Research 2000). Chapter 10 'Environmental Considerations' provides information on 'land degradation' and 'biodiversity' issues and guidelines for works in a range of construction and maintenance situations.

Road construction and maintenance works procedures for Ballina Council require the completion of the *Worksite Risk Assessment and Control Form* prior to the commencement and during works. The form contains a section on Environmental Controls which includes the preparation of an *Environmental Management Plan* and the assessment of a range of controls primarily for sediment control. A number of Safe Work Method Statements (SWMS) address Occupational Health and Safety (OH&S) issues related to work on roadsides. (See Appendix 10)

Other conditions for vegetation management adhered to by Ballina Council for roadside maintenance are those prescribed for works associated with the RMS contract to maintain the Bruxner Highway in '*Conditions of Contract Single Invitation Maintenance Contract (SIMC)',* (Roads and Traffic Authority NSW 2004). Section G34, 'Environmental Protection'

Roadside vegetation management consists of slashing, side-arm mowing and chemical control. Treatments may vary over time, some sites may require several cuts or sprays each year, other sites may only require side-arm cutting every two years. Current Council policy leaves much of the decision making on when and what treatment to use to field staff on an 'as needs' basis. Often maintenance is based on a set cycle as plant moves around the shire.

The Northern Region of the Roads and Maritime Services (NSW) (RMS) is responsible for the roadside maintenance of the Pacific and Bruxner Highways. The RMS contract Ballina Shire Council to maintain the roadsides of the Bruxner Highway. The RMSs maintenance obligations extends only to "Providing adequate sight distance at public road intersections, back to delineation devices such as guide posts, reflectors and guard rails. The RMS is not responsible for private road access, aesthetic or other parts of the road corridor". *(Personal Correspondence RMS Northern Region, Regional Environmental Advisor).*

An agreement has not been reached between Council and the RMS on responsibilities for the management of some sections of the Pacific Highway road

corridor. These areas are poorly maintained and support extensive weed infestations that may act as a source of weed re-infestation for Council managed roadsides.

3.4 Changes to Roadside Vegetation Management

Opportunity exists for Ballina Shire Council to protect and improve the quality and extent of native vegetation within the road reserve areas. Management techniques are available that protect and enhance vegetation with conservation value by minimising negative environmental impacts. One approach to improving the value of roadside vegetation is the introduction of an Integrated Roadside Vegetation Management Program (IRVM).

Roadside vegetation management needs to balance road safety (e.g. line of sight), clearance for passage of vehicles (eg height of cane trucks), pedestrian usage, access for maintenance machinery and the practicalities of road construction, road maintenance and the installation of utilities.

The BRVMP aims to address the impacts on roadside vegetation by providing information for the following:

- Initiating an Integrated Roadside Vegetation Management approach to roadside vegetation maintenance
- Identifying best management practices for roadside activities and encouraging their adoption;
- Prescribing a 'vegetation treatment' category for the regular roadside maintenance of each sector of roadside;
- Providing guidelines for weed control;
- Recommending sites and methods for 'active' restoration;
- Introducing a roadside marker system for significant sites such as Threatened Species and Endangered Ecological Communities.

3.4.1 An Integrated Roadside Vegetation Management Program (IRVM)

As the knowledge on roadside vegetation grows and the results of the new vegetation treatments and the restoration potential of native vegetation become apparent, modifications may be made to vegetation treatment. Ballina Council may reduce the need for and cost of roadside weed management by re-establishing native vegetation at appropriate sites. This approach to roadside vegetation management is called ***Integrated Roadside Vegetation Management (IRVM).***

IRVM is a long term approach to vegetation management that develops procedures that encourage, enhance or re-establish desirable plant communities by evaluating areas to be managed and determining which plant communities best fit the area. IRVM provides self-sustaining, diversified, visually interesting vegetation whilst keeping road safety as an priority.

IRVM incorporates the establishment of suitable native species with a range of chemical and non-chemical weed control methods and the timing of control. An IRVM program will in the long term reduce maintenance costs by (i) replacing exotic grass species that require regular mowing with low growing native species that are largely self maintaining, (ii) replacing weeds with native plants requiring less management and (iii) reducing the reliance on herbicides.

IRVM is being developed largely in cool temperate climates. Innovation may be required to adopt the techniques to Ballina Shire's sub-tropical region. Implementation of IRVM requires long-term planning, knowledge of weed biology and life cycle and the appropriate weed control methods.

Integrated Roadside Vegetation Management (IRVM)

An Integrated Roadside Vegetation Management System

- Provides a safe, functional and environmentally improved roadway system;
- Develops a best practice approach that improves the quality and quantity of native roadside vegetation and enhances the scenic and environmental qualities of roadsides;
- Reduces the cost of roadside vegetation maintenance by establishing a sustainable management program that:
  - Encourages the maintenance and establishment of sites containing vegetation communities that provide habitat value and require low maintenance;
  - Uses cost effective techniques including reductions in slashing, chemical use and biological and environmental methods to discourage unwanted vegetation and promote desirable vegetation;
- Develops a monitoring and evaluation system to track costs and outcomes.

See Appendix 1 for additional information on IRVM.

The components of an Integrated Roadside Vegetation Management program are:

1. The gaols and objectives of the Program;

2. A mapping database identifying roadside conditions and problems– an inventory on roadside native vegetation, weed infestation, and attributes (e.g. heritage sites, threatening processes);

3. Specifications – standards detailing road management activities for each issue such as threatened species, particular weeds;

4. Field markers - signage to identify significant locations and/or GPS locating systems in maintenance plant;

5. A field marker register of signage (symbols, colours etc) used to identify roadside issues and actions;

6. A User Guide, Field Kit;

7. Identification of sites for active management, identifying ways to change undesirable conditions and discourage recurrences of problems;

8. Training and education requirements for personnel involved;

9. Monitoring and evaluation, regular inspections to identify issues requiring changes in actions, record keeping and reporting; and

10. Regular review of management techniques based on the monitoring and evaluation.

The BRVMP addresses several of these components and may act a foundation for the implementation of a IRVM program.

3.5. Generic Guidelines for Roadside Native Vegetation Management

Native vegetation may need to be impacted or removed during maintenance and construction activities. Below are generic guidelines for Best Management Practices for the removal of native vegetation common to a range of construction and maintenance activities.

Vegetation Management Best Management Practices
for Road Construction and Maintenance.

When working in the vicinity of native vegetation

- Avoid 'Cleaning up' (removing) fallen tree limbs, minimise the removal of leaf litter, unless necessary for road safety or OH&S concerns. Remove fallen timber where considered 'excessive', e.g. suppressing natural regeneration, causing soil compaction, significantly inhibiting water infiltration, or posing an unacceptable fire hazard;
- Attempt to keep machinery out from under the drip line of trees to avoid soil compaction and damage to tree roots; and
- Be aware of smaller, ground level plants such as orchids, grasses, and lilies as they are important habitat and food sources for native animals and a vegetation asset of the Shire.

Vegetation Removal

Before tree removal consider: the safety of staff, road users and property; the habitat value of the trees; the tree's historical significance; and the effect of tree removal on the appearance of the roadside. Where tree removal is required:

- Check Council's vegetation removal controls and follow correct procedures;
- Undertake the minimal clearing required for safety and sight distance;
- Fell trees into construction zone, not into undisturbed vegetation;
- Cut and stockpile excess timber in a cleared and accessible area for removal, to minimise disturbance of disposal. Be mindful of the habitat value of fallen timber;
- If material must be burnt keep clear from existing vegetation;
- Chip and mulch native shrubs and light tree branches to distribute native seed on construction site – do not chip and mulch weeds; and
- When pruning use the three cut method.

Re-vegetation works: When undertaking re-vegetation works

- Co-ordinate with Landcare groups to protect and augment existing plantings,
- Engage experienced and qualified bush regenerators or arborists to undertake sensitive works;
- Only plant locally indigenous plants especially in or near areas of significant native vegetation. Check with local suppliers to maintain appropriate species;
- Focus re-vegetation works to supplement existing habitat; and
- Provide adequately resourced maintenance at sites to deter weeds.

(Adapted from Kyogle Roadside Vegetation Management Plan)

Best Management Practices for roadside activities need to be widely distributed and adopted by field staff. Appendix 8 contains a summary of Best Management Practice Guidelines for Construction, Roadside Maintenance, Infrastructure Management, Fire Management, Minor Activities and Site Specific Activities.

3.5.1 Roadside Vegetation Maintenance

Roadside vegetation maintenance is often a difficult and labour intensive task. Current roadside maintenance comprises slashing and side-arm mowing with limited chemical control where mechanical access is impractical. Chemical maintenance is required near sign posts, safety barriers, culverts, ditches, steep banks, cuttings, trees, fence lines and encroachments by surrounding land holders, There is currently minimal 'active' management to rehabilitate roadside native vegetation remnants.

The Ballina Roadside Vegetation Survey (BRVS) (Envite 2006) provides increased knowledge and awareness of the extent and condition of the Shire's roadside vegetation. With this knowledge Council ***has a legal obligation to protect threatened species and Endangered Ecological Communities (EECs)*** and an opportunity to protect and enhance native roadside vegetation. The greatest influence on roadside native vegetation is probably regular roadside vegetation maintenance. Significant native vegetation and native regrowth occurs primarily at un-maintained sites or in areas inaccessible to machinery.

3.5.2 'Vegetation Treatment' (Maintenance) Categories

The Ballina Roadside Vegetation Survey (EnviTE 2006) assessed roadside sectors for a range of vegetation attributes (e.g. *'vegetation condition', 'age class'* and '*Vegetation Community*',' *presence of threatened species'* etc). Based on a combination of these attributes a ***'Vegetation Treatment Category***' or ***'maintenance regime'*** was allocated for each sector. Based on consultation with BSC roadside operational staff re practical considerations minor modifications were made to EnviTEs recommendations. In addition to the conservation value the vegetation treatment category considers road safety issues and the practical aspects of day to day management.

The 'Vegetation Treatment Categories' are:

1. Bush Regeneration Only (RED)
2. Slash and Side-arm (GREEN)
3. Slash only, 'side-arm mowing' only as required after consultation (ORANGE)
4. Slash - No Spray (YELLOW)
5. Spray Only – weeds (PURPLE)
6. Spray then Slash (BLUE)

See Table 7 for a prescription of these *'Vegetation Treatment Categories'.*

Table 7 : Ballina Roadside 'Vegetation Treatment Category' Profiles

Roadside Vegetation Treatment Category Profiles

1. 'Bush Regeneration Only' : (RED)
Areas of high conservation value. Threatened plants may be in or overhanging the road maintenance zone.

Sectors to be signposted. Vegetation maintenance work to be performed by qualified bush regenerators or arborists.

2. 'Slash and Side-arm' : (GREEN)
Use on areas where low likelihood of native vegetation of conservation value in maintenance zone.

Slash grass verges with a tractor PTO driven grass-cutting deck and/or a tractor mounted side-arm flail mower. Trim woody vegetation and undesirable vegetation on embankments and cuttings with side-arm flail mower.

3. 'Slash Only' - 'Side-arm mowing' only as required after consultation (ORANGE)
Use on roadsides with a grass verge and a maintenance area containing threatened plant species, endangered ecological communities or other significant vegetation.

Use of a tractor PTO driven grass-cutting deck to trim road shoulder vegetation without impacting on native vegetation. Side-arm mowing is not recommended. Occasional side-arm mowing may be required to increase sight distances or to allow access for slashing when vegetation is encroaching near the carriageway.

If the pruning of native vegetation encroaching on the road ***other than threatened species*** is required, '**Side-arm mowing' may be used after consultation**. Work in sensitive areas may need to be conducted using use such tools as a pole saw.

Where **threatened species may be impacted** work may need to be undertaken by **qualified bush regenerators or arborists.**

Prior to side arm mowing native vegetation in a ORANGE sector consultation is required. 'A Change of Roadside Vegetation Treatment Application' Form may need to be lodged.

4. 'Slash - no spray' : (YELLOW)
For areas where spray drift may cause damage to native vegetation or concern e.g. adjoining landholders requesting no pesticide use near their properties.

No herbicide to be used in this zone. Landholder registered road lengths will be added to the Operations 'Vegetation Treatment' Map. The roadside areas will be marked with guideposts and may display a sign "No Spraying".

5. 'Spray only' : (PURPLE)
For road verges containing significant vegetation infested by weeds where it is unlikely or undesirable that grasses will establish following weed control.

Use herbicide as the primary control for roadside vegetation maintenance. Reduces damage to native vegetation and dispersal of weeds.

6. 'Spray then Slash' : **(BLUE)**
Sites with weed infested native vegetation, often bordered by a grass verge.

Apply herbicide to control weeds in native vegetation and surrounds as required prior to slashing to ensure weed kill before slashing. The selective use of herbicide (type and method of application) can assist in encouraging desired native vegetation to establish following weed control. Used to reduce damage to native vegetation and prevent the dispersal of weed propagules. See Appendix 14 for weed control techniques.

3.5.3 Guidelines to Roadside Vegetation Treatment Categories

Short and long term modifications are recommended to Ballina's roadside vegetation maintenance regime. The main changes to short term maintenance are:

1 Reductions in slashing and side-arm mowing to decrease damage to native vegetation, encourage native vegetation growth and reduce the spread of weeds.

2 The introduction of the vegetation treatments, (maintenance categories) 'Bush Regeneration Only', 'Spray Then Slash' and 'Spray Only' to facilitate the rehabilitation of native vegetation and reduce the potential for the spread of weeds; and

3 An increase in 'Slash - No Spray' (no herbicide –use) areas where residents have registered their desire not to have herbicides used near their properties.

3.5.3 (a) 'Bush Regeneration Only' (Red Sectors)

Guidelines for
1. BUSH REGENERATION ONLY – (RED SECTORS)

Maintenance work and management to be performed by qualified personnel, bush regenerators of arborists.
Sectors to be marked by guide-posted.

3.5.3 (b) 'Slash / Side arm' mowing (Green Sectors)

Guidelines for
2. SLASH and SIDE-ARM MOWING - (GREEN SECTORS)

Reduce the impact of side arm mowing and slashing on native vegetation by:

– Slash or Side-arm mow native vegetation only when necessary for road or fire safety. Follow the precautionary principle - don't mow if in doubt re the impact on native vegetation

– If mowing weeds watch for native species, if native species present, raise cutting height of the slasher or side arm mower to protect native understory species and ground covers;

– Mark out and protect young seedlings when slashing in locations where an increase in vegetation height does not impair on road safety ;

– Slash only to the back of the table drain to avoid damage to native vegetation outside the road formation;

– Plan slashing so as not to spread weeds. Be aware of slashing weeds bearing seed or that may be spread by disturbing vegetative matter. Clean down equipment that has been in contact with weed propagules; and

– If roadside is in a fire risk area attempt to keep fuel loads low, slashing before fuel loads are high.

3.5.3.(c). 'Side-arm mowing' only as required after consultation (Orange Sectors)
The major change to roadside vegetation maintenance prescribed is the reduction in 'Side-arm mowing'. The 'Slash only'- No Side-arm' vegetation treatment category has been introduced to reduce the damage to stands of native vegetation and to facilitate opportunities for native vegetation to re-establish.

A review by the maintenance team leader of the recommendations in the Ballina Roadside Vegetation Survey identified a number of road sectors where it was felt Side-arm mowing would occasional be needed in the 'Slash Only' sectors to maintain road safety and maintenance access. (See Appendix 5, Table 5.1 for a list these sectors).

Guidelines for
3. SLASH ONLY - 'SIDE-ARM MOWING' ONLY AS REQUIRED AFTER CONSULTATION
ORANGE SECTORS

Sites where 'Side arm' mowing is undesirable

- Grass verge only, 'Side-arm mowing' is not necessary.
- 'Side-arm mowing' poses a threat to or damages threatened species or significant native vegetation.
- There is potential for restoration of native vegetation which will reduce maintenance needs

Situations where 'Side-arm' may be required in 'Slash Only ' No Side Arm' zone

- Road safety issues, e.g. require increases 'line of sight' or access, native trees encroach on road
- Weed species e.g. Lantana encroaching on road

IF SIDE ARM MOWING IS REQUIRED IN SLASH ONLY SECTOR

If you see a need to 'Side arm mow in a 'Slash Only' sector on the Roadside Vegetation Treatment Map (Orange Zone)

(i) Before side-arm mowing - Climb out of the machine and inspect the site for native vegetation, check for trees and shrubs, and the understorey for seedlings and ground covers.

(ii) If native vegetation is present, can you Side-arm without causing damage to the native vegetation?

(iii) If uncertain
- contact Road Maintenance Team Leader or Open Spaces and Reserves Natural Resource Extension Officer for a site assessment or
Compete and lodge a '*Change in Roadside Vegetation Treatment Application' Form '* and move on to next sector (forms are supplied in the Field Kit).

3.5.3.(d). 'Slash – No Spray' Zone (Yellow Sectors)
One site on The Coast Road, near the northern boundary of the Shire is prescribed 'Slash – No Spray'. In addition a growing number of residents are registering with Council for a 'No Roadside Pesticide Use' on sites adjoining their properties. Such requests are lodged by organic farmers, landholders with crops sensitive to herbicide drift or concerned about health related issues etc. (See Appendix 5 Table 5.2 for No Roadside Pesticide Use Registrations)

Guidelines for
4. SLASH – NO SPRAY (YELLOW SECTORS)

No herbicides to be used in the "Slash – No Spray sectors

Council will accommodate requests for 'no-spray sites' from landholders by:

- Enter the registrations onto Council's GIS system;

- Zoning these road sectors as 'Slash, no-spray' sites and using herbicides as a last maintenance resort;

- Notify staff and install roadside guideposts to advise operators of a 'No-spray' zone;

- When funds available install GPS units in maintenance plant to warn operators;

- Negotiating an agreement between BSC and landholders, outlining the landholders responsibility to maintain the road verge if mechanical maintenance is not practical;

- Prepare guidelines and training for registered landholders on the landholders role and safety responsibilities in maintaining and working on road sides; e.g. through the Ballina Roadside Landcare Group.

3.5.3.(e). 'Spray Only' (Purple Sectors
This treatment is prescribed to reduce the spread of weeds and increase the potential for native vegetation regeneration at highly disturbed, weed infested sites containing significant native vegetation.

Guidelines for
5. SPRAY ONLY (PURPLE SECTORS)

– Monitor and assess sector for weed seeding times and determine a combination of chemical and mechanical vegetation management.
– Plan and coordinate the appropriate techniques and timing of weed control, prior to weed species seeds ripening. Prepare site plans for individual road sectors.
– Spraying to be conducted by staff trained and experienced in plant identification.

3.5.3 (f). 'Spray then Slash' (Blue Sectors)
'Spray then Slash' maintenance encourages native vegetation and reduces the dispersal of weed propagules. The vegetation in this zone is typically a grass strip along the road edge backed by weed infested native vegetation. The area requiring chemical weed control is often separate from the area to be mechanically controlled.

Guidelines for
6. SPRAY then SLASH (BLUE SECTORS)

– Control weeds in 'spray zone' (weedy area) as for 'SPRAY ONLY' TREATMENT
– Slash remaining area after weeds have been controlled.
– Slash remaining area

Table 8: Occurrence of 'Vegetation Treatment' Categories for Ballina Roadsides

Zone	Vegetation treatment	No. of Sectors	Colour code	Comments
1	Bush Regeneration Only	6	RED	• Threatened species -sensitive vegetation • Regeneration by qualified staff only
2	Slash / Side-arm	368	GREEN	• Non-sensitive vegetation • Standard maintenance regime
3	Slash Only – No Side-arm *"Prescriptive Side arm only as required after consultation"*	970	ORANGE	• Reduce damage to native vegetation • Sensitive vegetation, may contain threatened flora in zone • May require occasional maintenance for road safety • Side–arm permissible for non- natives. • Side-arming of natives requires approval.
4	Slash - No Spray	1 + No spray Registered sites	YELLOW	• In areas sensitive to herbicide, including requests from neighbouring landholders e.g. organic farms. (See Appendix 5, Table A5.2 for registered sites)
5	Spray Only - weeds	40	PURPLE	• Invasive weeds intermixed with desirable native vegetation • To enhance native vegetation and reduce the spread of weeds
6	Spray then Slash	43	BLUE	• Mainly for sites were a grass verge borders desirable native vegetation impacted by invasive weeds • To enhance native vegetation and reduce the spread of weeds

Note : Occasionally a 'special treatment' may be required at specific sites where there is an object such as threatened species or heritage item or in difficult to access locations such as drains, safety rails or adjacent to fence lines

See Map 1 Ballina Roadside Vegetation : Vegetation Treatment

See Appendix 5 for additional information on sector locations and details.

Consult with leading hand, office maintenance staff or natural resource extension officer if unsure of what maintenance activity vegetation treatment to apply.

Table 9 : Location of Vegetation Treatment Sectors

1. Bush Regeneration Only – (RED Sectors)

UID = A 'Unique identification number' for each sector on GIS Roadside Vegetation data base

Treatment	Street	Locality	Comments
Bush Regen Only **RED**	42 Byrnes Lane Tuckombil UID = 114	East side road, from 280 to 580 metres north of Rifle Range Road.	Weed dominated, significant rainforest trees, Wandering Jew, Madeira Vine, Climbing Asparagus Fern.
	East St Tintenbar UID = 1&2	All of East Street	Rainforest species, Threatened Species, weed infested, some plantings, regeneration work on neighbouring property, Madeira Vine, Camphor Laurel, Privet, Lantana.
	Pearces Creek Rd Alstonvale UID = 96 & 97	Both sides road from corner with Sneaths Road for 300 metres.	Weed dominated, rainforest species, adjacent to significant remnant. Privet, Lantana, Camphor Laurel,
	127 Tuckombil Rd Tuckombil UID = 117	North side road from 130 metres west of Teven Road intersection.	Weed dominated, Threatened rainforest Species, Privet, Wandering Jew, Climbing Asparagus Fern.

4. Slash – No Spray - (YELLOW Sectors)

Slash – No Spray **YELLOW**	Byron Bay Rd Broken Head UID =1338	East side road, 130 metres to 230 metres south of Bundaleer Road.	Flood prone site, Paperbark, Camphor Laurel, Lantana and annual weeds.
	No – Spray Landholder Registration	**As per No Herbicide Use Register**	**Request by neighbouring landholders. SEE APPENDIX 5 - TABLE 5.2 FOR CURRENT REGISTER OF SITES.**

5. Spray Only - (PURPLE Sectors)

Spray Only	Street	Locality	Details
PURPLE	Angels Beach Dr East Ballina UID = 346, 347, 348	East side of road from 580 metres north of Bangalow Road intersection to 400 metres past North Creek bridge	Wetland native species, Morning Glory, Bitou Bush and Lantana, traffic concerns
	556 Back Channel Rd,. Wardell UID = 1169, 1170	Vegetated area last 200+ metres of road, both sides of road	Weedy, rubbish dumped, Brush Box, Camphor Laurel, Queen Palms, Morning Glory
	Byrnes Lane Tuckombil UID = 103	West side road from Rifle Range Road for 450 metres.	Rainforest with Camphor Laurel, landscaping, Wandering Jew
	The Coast Rd Lennox Head UID = 1250	Littoral rainforest edge, east side road, from 140 metres past Skennars Head Rd	Paperbark, Lantana, vine weeds, traffic
	Coolgardie Rd Coolgardie UID = 610 - 617	All of unsealed sections of Coolgardie Road, with native vegetation understorey	Wet sclerophyll, agricultural influence, weeds, Lantana, Camphor Laurel, mist weed.
	Creek Street Wardell UID = 1141	South side road first 500 metres. Urban area.	Semi-urban, heath, Whisky Grass, Lantana
	Fernleigh Rd (north) Brooklet UID = 269, 270, 271,	South-side road from 250 metres past Gaia resort entrance for 200 metres.	Rainforest, weed infested, lantana, Madeira Vine
	Fernleigh Rd (south) Brooklet UID =284	1,200 metres north of Tintenbar Road, north-east side road.	Rainforest, threatened species, Camphor lLurel.
	The Gap Rd Alstonville UID = 316	West side road, 520 m from Bruxner Hwy, north of creek crossing	Brush Box & Blackbutt, vegetation in good condition. Passionfruit, Traffic concern.
	166 Nashua Rd Fernleigh UID = 368	North side road, from 550 m from Tooheys Mill Road.	Weed dominated rainforest native species, plantings, Camphor Laurel, Fishbone Fern.
	Ross Lane Lennox Head UID = 1298, 1325	South side road from corner Coopers Lane for 200 metres.	Along drain, frog habitat,, Woodland species, Paperbark, Brush Box. Weed infested lantana, Morning Glory, Camphor Laurel.
	Teven Road Teven UID = 883	Patch native vegetation on creek bank, 1.25 kms north of Stokers Lane.	Mixed rainforest regrowth, degraded by weeds. Hard Quandong, Sweet Pittosporum. Molassess Grass, lantana
	Thurgates Lane Wardell UID = 1058 - 1061	All native vegetation along Thurgates Lane, both sides of road.	Impacted by agriculture and fire, Mixed native community, Lantana, Umbrella Tree,
	21 Tyumba Av Teven UID 863, 857	Native vegetated area for 200+ metres on both sides of road from Houghlahans Creek Rd intersection.	Diversity of rainforest species,Faombark, Red Ash, Weed infested, Lantana, Camphor Laurel, privet, grasses
	423 Uralba Rd Forest Rd, 37 Platypus Drive	All sites with native vegetation understorey along Forest Road.	Cleared and weedy, rainforest and wet sclerophyll species, wide range of weeds

Table 9 : Vegetation Treatment Sectors (con)

6. Spray then Slash - BLUE Sectors)

Spray then Slash BLUE	Street	Locality	Vegetation details
	16 Amber Place Meerschaum Vale UID = 457	Along all of South side of road	Weed dominated, rainforest species, lantana, Camphor Laurel.
	Angels Beach Dr East Ballina UID 344, 345	East side of road, from 40 metres west of Links Drive, south side of road, around corner	Woodland, Paperbark, Ground Asparagus, Morning Glory, traffic. Urban, landscaping, Lantana,
	Barlows Rd West Ballina UID = 1012, 1017, 1018	Vegetated area west side of road from Horizon Drive for 850+ metres	Narrow, weed dominated, mangroves, swamp forest, Asparagus, Lantana,
	39 Coolgardie Rd Coolgardie UID = 603	South side road from 500+ metres from Pacific Hwy.	Weed dominated, rainforest species, Tecoma (Yellow Bells), Lantana.
	120-186 Coolgardie Rd Coolgardie UID = 619, 621, 622, 633, 627	Only slash road edge on unsealed sections of Coolgardie Road where no impact on native vegetation understorey.	Weed dominated and slashed, rainforest species, Privet, Lantana, Camphor Laurel, Climbing Asparagus
	94 Dufficys Lane Tintenbar UID = 824	West side of road past Scanlans Lane.	Influenced by agriculture, pioneer rainforest species, orchids, Threatened Species, Camphor Laurel, Lantana.
	Empire Vale Rd Churches Lane Empire Vale UID = 920- 924,935 - 938	Southern side of road from River Drive	Cleared, weed dominated, significant narrow remnant, bordered by drain, Asparagus, Lantana, Morning Glory.
	Fishery Creek Rd West Ballina UID = 1020 -- 1023	Both sides of road from Pacific Highway except for grassed area on north side of road near end.	Weed dominated, mangroves, swamp forest species, asparagus, Coral Trees, Yellow Bells.
	137 Friday Hut Rd Tintenbar UID = 127	West side road 1km north of Tintenbar Road	Pioneer rainforest species, Privet, Umbrella Tree, Traffic,
	182 Nashua Rd Fernleigh UID = 362	South side road, 550 m from Tooheys Mill Road.	Rainforest species, impacted by agriculture, Lantana , Privet.
	North Creek Rd Skennars Head UID =1243	North side road from 400 metres from end for 500 metres.	Weed dominated, rainforest species, Ground Asparagus, Broadleaf Pepper. Brazilian Cherry.
	Pacific Hwy Wardell UID = 590	West side road, 200 metres south of Coolgardie Road.	Weed dominated woodland, Morning Glory, Winter Senna.
	162 Patchs Beach Rd Patchs Beach UID = 956	South side road, 300 metres from corner in village (opposite houses)	Weed dominated, Wetland species, garden escapees, Umbrella Plant.
	Pimlico Riverbank Rd Pimlico UID = 530,- 533	Along river bank 1.3 kms north of Perrys Lane and 1.1 kms west to corner.	Narrow, weed dominated, wetland edge, Climbing Asparagus, Bitou Bush, Coral tree, Morning Glory, Resurrection Plant.
	Pimlico Rd Pimlico UID = 570	West side road, north from Coolgaride Road corner, for 230 metres.	Weed dominated woodland, Coastal Cypress, Winter Senna, Fishbone Fern.
	River Drive East Wardell UID = 967	Small patch native vegetation east side road, 440 metres north east of Carney's Lane.	Narrow strip amongst agriculture, Wetland species, Morning Glory, Lantana
	Smith Drive West Ballina UID = 1007	Mangroves on riverbank on south side of road, west of industrial area.	Wee dominated, mangroves, Swamp Oak, Lantana, Morning Glory.
	409 Uralba Rd Uralba UID = 777, 778	Native vegetation on banks on southern side of road for 1.2 km east of Forest Road intersection.	Plantings, weed dominated woodland, Camphor, Singapore Daisy, Lantana
	Victoria Park Rd & Ln Dalwood UID = 814-- 817	East side of road adjoining the edge of Victoria Park Nature Reserve. Spray then Slash, Active management,	Weed dominated, rainforest species, Mickey Mouse Plant, Camphor Laurel.
	Wardell Rd Meerschaum V UID = 173	Adjacent to native vegetation on west side of road, for 270 metres south of Bagotville Road intersection.	Landscaping, woodland, Camphor Laurel, Coral Tree

3.5.4 Weed (pest plants) management

Weeds are plants growing where they are not wanted. ***The BRVS identified weeds as a major threat to roadside vegetation***. Weed management is a major component of protecting sites of high conservation value vegetation.

Principles of Weed Control

- Avoid the spread of weeds by using appropriate maintenance and weed control methods (See Appendix 14 for information on weeds & their control).
- Plan maintenance works to move from low infestation to higher infestation.
- Clean down machinery before moving on.
- Slash, mow or use chemical control on noxious and environmental weeds prior to flowering / seeding.
- Instigate early control of 'sleeper weeds, weed species that are present in small quantities, but show signs of potential spread.
- Where soil disturbance occurs during construction or road maintenance, re-vegetate with native species as soon as possible.
- When undertaking bush regeneration do primary work at a rate that allows for follow-up maintenance with the resources available.

3.5.4.a. Which weeds to control

Priority sites for weed management are proposed in Table 10, Section 3.6.2. In addition to these priority sites the following weed management is recommended as resource allow:

- Identify and control 'sleeper weeds' (See Appendix 7, p38), isolated outbreaks of weeds with potential for rapid spread, especially in upper catchments;
- Shire wide control of weeds not yet widely spread along roadsides, but with potential for rapid spread e.g Madeira Vine (*Anredera cordifolia)*, Cats Claw Creeper (*Macfadyena unduis cati)* and Yellow Bells *(Tecoma stans*);
- Control weeds in sensitive and high conservation value environments as they appear; and
- Prolonged follow-up maintenance at all sites.

3.5.4.b. Methods of Weed Control

The preferred method of weed control is dependent on the type and species of plant, the degree of spread and the associated native vegetation. Weeds may be treated by mowing, slashing, herbicide treatments (spraying, cut and paint, etc), mechanical removal, vegetative suppression or a biological control agent or combinations of these methods.

3.6 Native Vegetation Rehabilitation

A component of an Integrated Roadside Vegetation Management program is active restoration of native vegetation. The BRVS identified sites of significant remnant native vegetation under threat in the road reserve where active management is desirable. This section prescribes the location and type of restoration works.

3.6.1 Vegetation Rehabilitation and Regeneration Techniques

Bush regeneration is the "rehabilitation of bushland from a weed infested or otherwise degraded state to a healthy community of indigenous plants". The ideal is to create a vegetation community whose composition is similar to what occurred on the site prior to disturbance. Regeneration usually involves removal of weeds and repair of disturbances so as to create an environment favourable to the sustainable regeneration of native plants. A bush regeneration project involves:

- Assessment and Planning;
- Rehabilitation techniques - Weed control and supplementary planting if required;
- Soil stabilisation;
- Monitoring and evaluation; and
- Ongoing 'follow-up' or maintenance.

Opportunities exist for rehabilitating roadsides at sites where:

- natural regeneration is occurring;
- native vegetation is under increasing threat;
- ongoing degradation is occurring due to human intervention; and
- construction or maintenance activities have caused vegetation disturbance

Levels of Intervention for Native Vegetation Rehabilitation

1. Natural regeneration - recovery is automatic and intervention not needed since natural disturbance regimes and regeneration processes are intact.

2. Assisted or accelerated regeneration - "triggering" interventions are used to facilitate natural recovery processes by:

- reducing weed seed inputs and weed growth.
- promoting germination from the natural seed bank through careful weed removal.
- stimulating re-sprouting and seed germination by using fire or smoke.
- altering the grazing regime using fencing, enabling native species to regenerate without trampling, nutrient enrichment or herbivory.
- altering water and nutrient inputs to the site by diverting or filtering stormwater, and

3. **Reconstruction -** living (eg. animals and plantings) and nonliving (substrate) elements are introduced or enhanced on more disturbed sites before recovery can begin.

4. **Type conversion (fabrication)** – better suited ecosystems are created to replace those unable to survive due to permanently changed conditions (eg. Roadsides)

3.6.2 Assessing and Prioritising Sites for Rehabilitation

The 'active' management of roadside vegetated sites compete with other Shire wide vegetation management priorities. The decision on where to allocate limited resources for native vegetation management is a complex task.

As a general rule decisions on prioritising sites for active management may be grouped into the following priorities.

High priority : regeneration sites where the objective is to maintain the natural condition of a native remnant of high conservation value. Sites generally are in good condition (Vegetation condition 4 or 5 or greater (From Table 3 p. 13)) and do not require a great degree of input, but require a low level of on-going maintenance.

Medium priority : Site more disturbed and under greater threat requiring more input of weed control and follow up maintenance.

Low priority : Sites mostly highly disturbed requiring greater levels of intervention weed control and long term follow up maintenance. Often isolated from other sites

The attributes identified in the BRVS e.g. '*vegetation condition' "age'* '*vegetation community'* and presence of '*threatened species'* was used to prioritise sites for active management. Table 10 lists the priority sites.

The final decision on where to prioritise resources is an ongoing process based on the experience gained through on-site works and on-going assessment.

Table 10: Roadside Vegetation Sites for Active Management (Rehabilitation).

UID = A 'Unique identification number' for each sector or point on GIS Roadside Vegetation data base (Map 1)

Priority	Site	Regions UID	Point UID	C	Attributes
1	**Pearce's Creek Rd** Alstonvale	96 97		4 6	***Significant rainforest remnant***, adjacent to larger remnant impacted by lantana, Privet and Camphor Laurel. Regeneration work being undertaken on site and adjoining land. Maintenance regeneration only.
2	**Pearce's Creek Rd** Alstonville	329		5	***Mixed rainforest regrowth.*** Adjoins Lumley Park sub-tropical rainforest remnant. Impacted by Madeira Vine and Camphor Laurel. Maintenance Slash only.
3	**East Street** Tintenbar	1 2	1, 2	4	***Rainforest regrowth,*** proximal planting, Impacted by Madeira Vine, Privet & Camphor Laurel. Maintenance bush regeneration only. Contains threatened species. *Syzigium hodgkinsonia* , *Macadamia tetraphylla*
4	**George Street** Tintenbar	320		5	***Significant remnant mixed rainforest regrowth***. Impacted by Madeira Vine, Privet
5	**Lumleys Lane** Wardell	1045 1034		5 4	Significant habitat, ***Cabbage Palms,*** Impacted by Lantana & Morning Glory. Maintenance no side-arm.
6	**The Gap Road,** Alstonville	316 312, 313		6 5	Good condition vegetation, ***mixed eucalypt forest,*** Blackbutt and Brush box. Weeds Lantana, Camphor Laurel and Passionfruit. Maintenance spray only. Unsealed road heavy traffic periods,
7	**Coolgardie Road** Coolgaride	614 to 617 621 to 623	132, 136,137	4	Mixture ***Eucalypt*** (Blackbutt and Brush Box) & ***rainforest regrowth***. High diversity, with threatened species, weed impacted by Lantana and Asparagus Fern, Maintenance 'Spray Only' some sectors. Sympathetic landholders, *Geijera paniculata, Macadamia tetraphylla*
8	**Forest Rd / Urallba Road** Uralba	759, 779,780, 782 to 787	179	4	Good habitat, ***Blackbutt and Brush Box, rainforest regrowth species***. Parts heavily weed infested, Coral Trees and Camphor Laurel *Syzigium moorei*
9	**Victoria Park Ln** Dalwood	814, 815	185,186,187	***4***	***Rainforest with heavy weed infestation, adjoins Victoria Park rainforest remnant. Macadamia tetraphylla***
10	**Bagotville Road,** Bagotville Meerschaum Vale Bagotville	1189 1142-1144 1147		6 5 4	Good habitat, ***significant wetland remnant***, Swamp Mahogany, Paperbark, Cordylines, Coastal Cypress, Bangalow Palm. Weed threat, Lantana. Paspalum. Maintenance Slash Only.
11	**Old Bagotville Rd** Wardell (Bagotville)	1163		5	***Swamp Mahogany, Banksia.*** Impacted by fire and Paspalum. Maintenance Slash Only.
12	**Thurgates Lane** Wardell	1054 to 1058 1060, 1061		4 5	Narrow strip, ***Eucalyptus and Banksia,*** community Bloodwood, Mahoganies, susceptible to fire. Impacted by Lantana. Maintenance no side-arm.
13	**North Creek Rd** Ballina	1270		5	***Wetland,*** tidal influence, mangroves and Swamp Oak. Vegetation in drain Maintenance no side-arm.
14	**Old Byron Road** Newrybar	639		5	***Mature rainforest planting*** in agricultural surrounds. Maintenance no side-arm.
15	**Teven Road** Teven	887		5	Good habitat, ***mangroves.*** Tuckeroos. Impacted by Camphor Laurel and Ochna. Traffic considerations.
16	**Wardell Road** Meerschaum Vale Dalwood	1031 1030, 1032,	264	5 4	Good habitat, ***Blackbutt, Brushbox, Paperbark***. Sections heavily impacted by Camphor Laurel and Lantana *Tinospora tinosporoides*
17	**Fernleigh Road (South)** Tintenbar & Fernleigh		46,49-51, 62,64- 67 58		***Threatened species*** *Macadamia tetraphylla, Tinospora tinosporoides*

- Note Priority numbers not necessarily in order
- For locations refer to Roadside Vegetation Data Base, Map 1 and Threatened Species Map in Field Kit.

3.6.3 Threatened Flora Species Management

The BRVS identified sixty locations contained one of more threatened plant species (plant species listed as either 'vulnerable' or 'endangered' under the under the *Threatened Species Conservation Act (1995)).* Seven threatened species were found *Archidendron hendersonii* (White Lace Flower) (3 sites), *Geijera paniculata* (Axe Breaker) (1 site), *Lepiderema pulchella* (Fine leaved Tuckeroo) (1 site), *Macadamia tetraphylla*, (Queensland Nut) (45 sites), , *Syzygium hodgkinsoniae (Red Lilly Pilly), (1 site) Syzygium moorei* (Durobby) (2 sites), and *Tinospora tinosporoides* (Arrowhead Vine) (7 sites).

The greatest threat to the continued survival of these plants is mechanical damage to the plant or increased exposure. This may be caused by roadside vegetation management. Threats may also occur from adjacent agricultural activities such as herbicide over-spray or clearing. Recent evidence of this was not apparent during this survey. Other observed threats are residential plantings of exotic and invasive weed species, with an alarming example observed adjacent to Victoria Park Nature Reserve (EnviTE 2006).

The possible occurrence of Threatened Species should be considered as being equal across all roadsides, regardless of the Roadside Vegetation Management Category. Noticing threatened species is difficult, especially by those inexperienced or from a maintenance vehicle, especially when occurring as seedlings or small specimens in a weed overstory.

Management of Threatened Species is incorporated into the prescribed 'vegetation treatment' categories. Sites with threatened species will be pointed out to field staff and marked. Field staff will be provided with training in plant identification. Licences required for working on sites with threatened species will be acquired by practitioners working in areas with threatened species.

See Appendix 6 'Threatened Species' for locations, policy and guidelines on management.

Maintenance Techniques for
Vegetation Containing Threatened Flora Species
and
Endangered Ecological Communities (EEC)

on road shoulder, table drain or outside regular maintenance zone

Where threatened flora species or EECs are located in the 'road maintenance zone' and may be impacted by slashing or side arm mowing. e.g. overhanging the roadside or on the side of the table drain, special treatment may be required. Treatments may include sensitive techniques to manage vegetation around threatened flora such as pruning with secateurs / loppers / hand saw, brush cutting and targeted use of non-residual herbicides.

This work must be conducted with extreme care so not to impact on threatened flora. This includes ensuring threatened flora specimens are clearly identified to workers and protected from potential damage eg no herbicide use or mechanical treatment within 2m of threatened flora.

When threatened flora encroachment is unacceptable to road maintenance standards an application for a licence to harm or pick threatened species, populations or ecological communities or damage habitat (Section 91 Licence under the Threatened Species Conservation Act 1995) is likely to be required.

At sites where threatened flora is located within the road reserve, but outside of the 'roadside maintenance' zone and side arm mowing is required on an irreugular basis operators need to be aware of the location of the threatened flora and take care not to operate in the vicinity of the specimen.

Be aware that threatened flora may be located on the fence line that delineates the shared boundary of the road reserve and adjoining property frontage. These fence lines may encroach on the road reserve and as a consequence, some of these specimens may be located well within the road reserve.

3.7 Managing Other Roadside Attributes

In addition to valuable native vegetation, road reserves may contain other attributes that are impacted by road works and maintenance.

Aboriginal Heritage Sites

The Aboriginal community have requested that their archaeological and ethnographic sites be protected from damage or destruction. Work in road reserves needs to acknowledge the living culture of local Aboriginal people and the cultural, social and recreational importance a site may play as part of the local aboriginal community's sense of country. Consultation with the local Aboriginal community regarding all matters pertaining to their heritage sites needs to occur to ensure the appropriate protection and management of cultural and heritage values. Upon finding archaeological deposits work should stop immediately and the finding immediately reported to the Department of Environment and Conservation and Climate Change (DECC) before any further disturbance.

Signage identifying heritage sites within road reserves managed by Ballina Council requires the approval of the local Aboriginal community.

Post European Settlement Heritage

Ballina Council is currently undertaking a Shire Wide Community Based Heritage Study (SWCBHS) documenting the shires heritage. Recommendations for the items worthy of listing and their future management of items have been made based on the study. A number of items identified by the BRVS (EnviTE 2006) have been identified in the Shire Wide Heritage Study (SWHS) process. The SWHS will investigate the additional items identified in the BRVS.

Table 4.7 - Appendix 4 lists the Heritage Items identified during the Ballina Roadside Vegetation Survey (EnviTE 2006)

3.8 Associated Activities

3.8.1 Education and Awareness

To implement this Plan successfully it needs to be understood and adopted by Council staff, Councillors, key stakeholders and the broader community. Distributing and promoting an easily understood version of the Plan to all those involved in roadside activities will assist in this endeavour.

Providing training to increase field staff's awareness of the presence and value of native vegetation and how their activities effect this vegetation is an important component of any successful management program.

Roadside management needs to recognise the many different, often conflicting desires of the community. Whilst Council has the major responsibility for roadsides including the management of roadside vegetation there is a role for the community. Many landholders take pride in managing their piece of roadside, canefarmers regularly mow roadsides grass verges as part of their drain line maintenance, residents beautify the road verge with ornamental plantings or keep the grass verge neatly mown.

It is to Councils advantage to encourage community ownership and participation in implementation of the BRVMP. This may be achieved by promoting the value of indigenous roadside vegetation and habitat and encouraging a greater understanding and care of roadsides by all sectors of the community. Actions to achieve stakeholder participation are found in Section 4.

Occupational health and safety issues arise when the public is involved in activities on Council administered lands. Council has an obligation to make the public aware of the dangers involved working near roadsides and the publics responsibility in taking safety precautions.

3.8.2 Report and Review

With the implementation of the recommendations in the BRVMP the condition and extend of roadside vegetation are likely to change. These changes may necessitate changes in management regimes.

It is therefore recommended that a review of the BRVMP be undertaken every five (5) years. The Civil Services Unit of Ballina Council prepare a report reviewing the plan. The report to:

- review 'Vegetation Treatments' – identify sites for change (based on site monitoring e.g. changes in 'vegetation condition' and 'growth stage' and consultation with field staff;
- determine Council performance regarding the implementation of and compliance with the BRVMP;
- identify new legislation that may effect Council's responsibilities in regard to roadside vegetation management; and
- form an basis for reporting on the BRVMP in the Council's State of the Environment Report.

Reporting and assessment forms may be found in Appendix 13

3.9 The Role of Roadside Maintenance Staff

Roadside maintenance operators are the people most familiar with the safety requirements and practicalities of roadside vegetation maintenance. They are the best placed to observe and assess roadside conditions and management needs and identify and implement the where changes in maintenance (vegetation treatment) are desirable.

Roles for Roadside Maintenance Staff in Assisting with Roadside Vegetation Conservation

Roadside maintenance field staff may make a valuable contribution towards the protection and maintenance of native roadside vegetation management by:

1. Report problems and impracticalities.
Successfully implementing the most appropriate 'vegetation treatments' is likely to be a long term process. Operators can report sectors where the prescribed treatment is impractical.

2. Monitoring change in the condition of native roadside vegetation and 'vegetation treatment' required.
As the condition of roadside vegetation changes the 'vegetation treatment' may be need to be altered. Sectors may require additional maintenance or become self sustaining. Field staff can report the maintenance changes required so maps and plans can be updated.

3. Spotting and reporting the outbreak of prominent weeds
Reducing the impact (threat) of weeds is a major factor in conserving native vegetation.
At certain times of the year roadside weeds become more visible e.g.
Camphor Laurel - September – October Bright –green leaves new growth flush
Small leaved privet - Heavy cream coloured flowering, September – October
Madeira Vine - Creamish yellow coloured flowers January February
Winter Senna – Bright yellow flowers all year round
Grasses are more prominent and easier to identify when in flower and seed.

Maintenance staff are in an ideal position to notice and report new weed outbreaks. Report sightings by completing the 'Weed Outbreak Report Form' in the 'Field Kit' or inform the team leader or Open Spaces and Reserve's Natural Resource Extension Officer.

4. Advance Integrated Roadside Vegetation Management (IRVM)
IRVM is a new direction in roadside maintenance. Finding practical methods and techniques will be a learning process. Field staff will play an important role in identifying and implementing the practicalities of the IRVM program.

To following actions will facilitate increased involvement by operational staff:

- Provide training to and discussion with operational staff to increase awareness of the benefits of enhancing native vegetation and raising skill levels in managing native vegetation;
- Encouraging a shared responsibility for the maintenance of roadside sectors between Ballina Shire Council's 'Engineering Works' and 'Open Spaces and Reserves'. 'Bush Regeneration Only', 'Spray Only' and Spray then Slash' sectors and pruning of sensitive native vegetation may need to be performed by qualified bush regenerator or by operational staff working with regenerators; and
- Providing incentives for input from roadside maintenance staff in identifying and monitoring significant vegetation sites and weed infestation.

4 IMPLEMENTING THE PLAN RECOMMENDATIONS

This section summarises the recommendations required to implement the Ballina Roadside Vegetation Management Plan. See Table 11 page 51 for a list of actions.

4.1. Administration

4.1.1 Adopt the Ballina Roadside Vegetation Management Plan

- Ballina Shire Council adopt the Ballina Shire Roadside Vegetation Management Plan and Integrated Roadside Vegetation Management program approach to roadside vegetation management.

4.1.2 Establish a formal process to implement the Plan

Undertake the following actions to implement the Plan.

- Nominate a officer to coordinate the implementation of the Plan and the formation of a ***Roadside Vegetation Conservation Group*** (RVCG) consisting of representatives from Engineering Works, Open Spaces and Reserves, road maintenance and construction field staff.
- Based on the recommendations within the BRVMP and the decisions by the RVCG, instruct field staff on adherence to the implementation of appropriate maintenance (i.e. vegetation treatments') for roadside sectors and best management guidelines for activities within the road reserve.
- Define the roles and responsibilities of and allocate adequate resources to Council units to implement the changes in roadside vegetation maintenance.

4.1.3 Policy Development

- Develop an 'Integrated Roadside Vegetation Management Policy' and policies for individual roadside activities such as harvesting timber, firewood collection, seed collection and flower harvesting. (Similar to existing Grazing Stock on Road Reserves Policy No GO1). For example

- Harvesting of materials form Ballina Roadsides is not permitted except under licence with permission of Council under the following circumstances:
  - Seed for bona fide revegetation projects within the local community where no other source of local seed is available: and
  - Harvesting of timber only in defined road safety, fence line or service clearance zones, or where a tree has fallen, or appears likely to fall into clearance zones.

4.2. Assessment and Planning

4.2.1 Develop an Integrated Roadside Vegetation Management Plan

- Develop the components of Integrated Roadside Vegetation Management (IRVM) Program involving all Council departments and agencies undertaking activities within the road reserve system. (Through the *Roadside Vegetation Conservation Group*)
- A component of the IRVM program would be ***Integrated Weed Management (IWM)*** program.

4.2.2 Update Ballina Roadside Vegetation Survey (BRVS)

- Update vegetation mapping from the BRVS, reassess Vegetation Communities so they match those used in the Ballina Shire Vegetation Mapping. Re-survey every five years to identify changes in vegetation condition, extent etc.
- Determine additional locations containing roadside threatened flora. Prepare 'vegetation management plans' for areas with Threatened Species,
- Review 'Vegetation Treatment' categories on a regular basis based on assessment of road safety requirements and .native roadside vegetation condition and value.
- Continue to develop priorities in management to actively enhance the value of roadside native vegetation.

4.2.3 Additional studies, surveys and research

Identify additional significant environments and other roadside features in:

- Road reserve areas not surveyed in the Ballina Roadside Vegetation Survey (EnviTE 2006) e.g. unformed roads, paper roads. Initially through aerial photo interpretation followed by ground truthing;
- Urban roadsides;
- Roadsides administered by the NSW Road and Maritime Services; and
- Encourage research through such avenues as post-graduate Southern Cross University environmental science students.

4.2.4 Site Plans

- Prepare site plans for high priority active management sites, (for locations. see Table 10 - Roadside Vegetation Sites for Active Management p39).

4.3. On-Ground management

4.3.1 Implement the Integrated Roadside Vegetation Management Program

- Implement the IRVM program for Ballina roadsides based on the material developed for the IRVM Plan in action 4.2.1

4.3.2 Roadside Vegetation Maintenance:

- Undertake roadside vegetation maintenance in accordance with the Operational Map 1 - Roadside *Vegetation Treatments – Ballina Shire* and prescribed in Section 3.5

4.3.3 Install and Maintain a Roadside Marker System:

- Install and maintain a green roadside marker post at a distance of 15-20 metres from beginning and end of sector to identify locations of 'threatened flora' species, 'Endangered Ecological Communities', heritage items and 'sensitive sites' to identify locations to roadside operators. (See Appendix 2 Ballina Shire Roadside Vegetation Register).
- If the marked site is off the road verge, outside the slashing line but in an area where occasional maintenance is required e.g. irregular spraying or side-arm mowing, install markers in a location that clearly defines the site e.g near fence lines etc.
- Install GPS systems in roadside maintenance plant to electronically identify and warn operators of significant sites. This may negate the need for a marker system.

It is suggested that the marker system not be made widely known to the general public to avoid threatened flora being subject to malicious damage and illegal poaching of propagative material.

4.3.4. Establish and Maintain a Register of Roadside Significant Sites and the associated Roadside Marker System.

- Maintain a register for this marker system to help facilitate an annual audit, the easy reinstallation of damaged and/or removed guide posts and the installation of posts for new sites. Establish and maintain a register of the attributes of significant sites in conjunction with the roadside marker system. Registration and management of heritage sites to be linked to the Ballina 'Shire Wide Heritage Study'

4.3.5 Active Roadside Vegetation Management (Bush regeneration)

- Identify, assess and prioritise high conservation sites for active management. Where desirable engage qualified staff to maintain valuable sites (See Section 3.6.2 and Table 10 for suggested sites).
- Apply to the Office of Environment and Heritage for a **Section 91 Licence** to harm or pick threatened species, populations or ecological communities or damage habitat under the *Threatened Species Conservation Act 1995.*

4.3.6 Weed Management:

- Undertake targeted control of roadside weeds to reduce future liabilities associated with spread and increasing removal costs. (See section 3.5.4).

4.4. Training, Liaison, Promotion and Communications

4.4.1 Prepare a Field Guide for Roadside Construction and Maintenance:

– Incorporate recommended environmental practices from existing documentation into a field booklet **'Construction and Maintenance Activity Guidelines'.** Circulate the booklet to appropriate staff, Council vehicles and plant and roadside management contractors.

4.4.2 Staff and Contractor Training

Advise and train roadside maintenance staff by conducting workshops and field trip(s) on the following:

(i) Induction to the Field Kit;

(ii) Interpreting the 'Ballina Roadside Vegetation – Vegetation Treatment' Map;

(iii) Using Roadside Marker system and associated sites register and/or the alternative GPS in vehicle warning system;

(iv) Completing the Roadside Vegetation Assessment Form;

(v) Ability to distinguish between natives and non-native vegetation;

(vi) Ability to assess value and condition of native vegetation, recognise and distinguish vegetation communities including the presence and content of native understorey species;

(vii) Identifying sensitive sites including examples of Threatened flora - to increase awareness and understanding of threatened species and associated legislation, to identify the location of roadside threatened flora. Supply pictures threatened species; and

(viii) Discuss other roadside maintenance issues.

4.4.3 Aboriginal Liaison

- To avoid incidental Aboriginal heritage impacts from road operations continue to liaise with the Jali Aboriginal Land Council, Jali Aboriginal Elders, custodians and knowledge holders to resolve any issues.

4.4.4 Local Residents Liaison

To accommodate roadside residents desirous of no pesticide usage adjacent to their properties and those willing to maintain roadsides adjacent to their land holdings:

- Maintain a register of landholders desires for roadside management options (e.g no herbicide use and self maintenance or steward roadside strips) near their properties;

- Notify road maintenance staff of these sites;

- Enter data onto maintenance vehicle cab based GIS system when available;

- Prepare guidelines for landholders desirous of 'no herbicide' usage near their properties. Emphasise owners responsibility re safety issues and legal requirements associated with roadside maintenance (Note: Bellinger Shire Council as a model);

- Support the 'Ballina Roadside Vegetation Landcare Group' as a vehicle through which BSC may inform and guide concerned residents;

- Place the BRVMP on Councils web-site and provide copies for purchase.

- Promote the BRVMP through the local media; and

- Prepare and widely distribute a brochure highlighting the public's role in roadside vegetation management (Consider this action in conjunction with other neighbouring Councils). Content of brochure to include (i) protecting native vegetation on roadsides (ii) Weed identification and management on roadsides (iii) Appropriate roadside planting.

4.4.5 Liaison with Far North Coast Weeds Authority

- Forward the BRVMP to Far North Coast Weeds Authority. Note relevant data in the Plan on roadside noxious weeds and threatened flora.

4.4.6 Liaison with other local Councils

- Liaise with neighbouring Councils Lismore, Byron and Richmond River Valley re their progress in roadside vegetation management and opportunities for a coordinated approach to management.

4.4.7 Liaise with the Roads and Transport Authority of NSW

- Liaise with RMS NSW on management of roadside vegetation on the Pacific and Bruxner Highways. BSC is contracted to maintain the Bruxner Highway roadsides. Sections of the Pacific Highway roadsides are heavily weed infested and act as a potential source of weed propagules.

4.5. Monitoring and Evaluation

4.5.1 Review the Plan

- Review the implementation of actions relating to the BRVMP on an ongoing basis with a formal review every three (5) years. Amend management regimes as necessary.

4.5.2 Review progress on Integrated Weed Management (IWM) and Integrated Roadside Vegetation Management (IRVM) Programs

- If implemente Integrated Roadside Vegetation and/or Weed Program regular review will be required to determine if methods and techniques being applied are appropriate and successful.

4.5.3. Audit of Roadside Threatened Flora

- Undertake an audit of roadside threatened flora and all roadside vegetation every 5 (five) years.

4.6 Actions for Implementation

Table 11; Actions for the Implementation of the Ballina Roadside Vegetation Management Plan

Management

Action No.	Activity Type	Actions	Priority	Who	Time	Comment
1.1	**Management & Resourcing**	Ballina Council adopt the Ballina Roadside Vegetation Management Plan (BRVMP).	High	BSC	ASAP	Incorporate recommendations into a Ballina 'Roadside Vegetation Policy '
1.2		Council nominate a officer to coordinate the implementation of the BRVMP.	High	BSC	ASAP	Contact officer Natural Resource Extension Officer, Open Spaces and Reserves
1.3		Council form a Roadside Vegetation Conservation Group to coordinate inter-Unit responsibilities and resource allocation to roadside vegetation management. Roles to (i) determine works & practices (ii) define roles & responsibilities, (iii) instruct field staff (iv) identify if practices are adequate for protection and meet safety requirements and (v) review vegetation treatments.	Medium	BSC	ASAP	Committee membership, representatives from Engineering Works & Open Spaces and Reserves The Group meet Quarterly or 2 times a year See section 4.1.2.
1.4		Provide an annual allocation for the active management (rehabilitation) of high conservation value vegetation sites within the road reserve system.	High	BSC	Annual budget period	Identify possibilities external funding e.g. cooperate sponsorship for road side sections
1.5		Apply for external funding for the rehabilitation of high priority sites beyond Councils base budget.	Medium	BSC	Ongoing	
1.6		Inform Utility Service providers of the intent of this Plan. Ensure Utilities and their contractors undertake roadside works in a manner supporting recommendations.	High	BSC	2012	Ensure utilities inform their contractors
1.7		Include an 'Environmental Management' clause within all tender documentation for construction and maintenance works on Council controlled roads.	Medium	BSC	2013	Conditions in contracts - Works comply with the BRVMP - Contractors and Council workers have the appropriate environmental training - Revegetation & restoration works are included as part of the contract.
1.8		Council develop policies for IRVM and associated roadside activities such as harvesting of materials from roadsides.	Medium to low	BSC	2014	See Section 4.1.3.
1.9		Obtain necessary licences for work with Threatened Species.	High	BSC	Prior to on-ground work	Section 91 Licence under the TSCA (1995)

Table 11 (con) ; Actions for the Implementation of the Ballina Roadside Vegetation Management Plan

Planning, Data collection and Mapping

Action No.	Activity Type	Actions	Priority	Who	Time	Comment
2.1	**Planning, data collection, and mapping**	Amend the roadside vegetation maintenance program as prescribed in the Roadside 'Vegetation Treatment' categories of the Ballina Roadside Vegetation Operational Map and associated information in the BRVMP.	High	BSC	2012 onward	Introduce change in stages. See Section 3.5 for details of 'roadside vegetation treatments'.
2.2		Update the 'Roadside Vegetation Polygon' and 'Point' data layers from the BRVS on 'Map Info' • Naming of Vegetation Communities, • Add High conservation value roadside vegetation sites.	Medium to high	BSC	2014	Standardise Vegetation Communities listed in the BRVS to match those in the Ballina Shire Vegetation Mapping
2.3		Prioritise sites for rehabilitation. Prepare a re-vegetation schedule/plan for roadsides for: a) Council works and b) potential community work.	High	BSC Consultant	2012 onward	See Tables 10 p.39 for recommended sites **Consult with EnviTE for final determination of priorities**
2.4		Prepare vegetation management plans for high priority active management sites.	Medium to High	BSC Consultant	2012 onward	'High conservation value' sites, 'Spray Only' and 'Spray – Then Slash' sites. See Table 9 p.34 and Table 10 p.39
2.5		Prepare an 'Environmental Protection and Inspection Form' common to all construction and maintenance work within the road reserve. (See attached draft).	Medium	BSC	2009	Update existing forms used by Council
2.6		Improve mapping of roadside weeds.	Medium	BSC	2012 onward	Map when most noticeable e.g Madeira Vine in flower –February, small-leaf privet flowers Early Spring
2.8		Develop an 'Integrated Roadside Vegetation Management Program. (IRVM), (See Section 3.4.1).	Medium to High	BSC	ASAP	A gradual process, active management of priority sites may be an initial step.
2.7		Develop a Roadside Weed Control Program with FNCW, & Landcare groups. Base the program on Integrated Weed Management techniques i.e. • prioritised weed species , e.g level of threat; • value of vegetation at sites; and • potential for spread of weed species.	Medium to High	BSC	2013 onward	• Weed categories e.g. sleeper weeds invasive vines, and exotic grass • Sites where wind born seeds have potential for wide dispersal example top of Alstonville cutting

Table 11 (con); Actions for the Implementation of the Ballina Roadside Vegetation Management Plan

Planning and Mapping

Action No.	Activity Type	Actions	Priority	Who	Time	Comment
2.9	**Planning, data collection and mapping (con)**	Identify strategic corridor links to roadside vegetation and other remnant vegetation areas.	Medium	BSC	2013	
2.10		Explore Ballina Shire Council vegetation mapping for vegetated land adjoining high conservation roadsides to protect roadside vegetation and adjoining buffers.	Medium	BSC	2013 onward	
2.11		Prepare a Koala Management Plan, identify sites where koalas cross roads during migratory period (August/ October).	Medium to low	BSC	2014 onward	Mark koala crossings with intent to avoid working in koala corridor during migratory season
2.12		Undertake a full audit of roadside threatened flora.	Medium to high	BSC	2013 onward	In the next 3-5 years
2.13		Identify additional significant valuable environments and other roadside features .e.g. (i) Rural road reserves not surveyed in the BRVS (EnviTE 2006) e.g unformed roads, paper roads (ii) Urban roadsides (iii) Roadsides administered by NSW RMS	Medium	BSC	2013 onward	
2.15		Encourage opportunities for research through such avenues as Southern Crooss University (SCU).	Medium to low	BSC	ASAP	
2.16	**Cultural heritage**	Develop a register of sites of cultural or heritage value located on roadsides.	Medium to high	Strategic	2013 onward	Integrate with Shire Wide Community Heritage Study
2.17		Undertake field staff training to increase awareness and recognition skills of heritage items and issues.	Medium to high	BSC	2013 onward	Items such as indigenous artifacts. mounds, middens, surface scatters, tools, etc
2.18		Assure that contractors refer to the register of cultural or heritage areas to identify any site that may be located within the proposed works area during the preparation of any contract/tender for works on council controlled land.	Medium to high	BSC Contractors	Ongoing	

Recommended survey work

- **Identify sites** 1. Under tidal influence 2. Adjacent to nurseries which may act as a source of weed propagules 3. With additional habitat features e.g. streams or ponds 4. Suitable for enhancement of natural regeneration and long term reduction in maintenance needs eg replacing exotic grass species with native ground covers. (E.g. areas under native canopy, where adjacent landholder is interested in roadside vegetation management).
- Look at the vegetation in context of larger landscape (corridors, sites in the middle of inhospitable areas that may act as refuges, stepping stones

Table 11 (con): Actions for the Implementation of the Ballina Roadside Vegetation Management Plan (con)

On-ground Implementation

Action No.	Activity Type	Actions	Priority	Who	Time	Comment
3.1	**General Roadside Vegetation Maintenance**	Implement the Integrated Roadside Vegetation Management Program (IRVM).	Medium	BSC	Ongoing	See section 3.5.5
3.2		Undertake roadside vegetation management in accordance with the Operations Map, Field Kit and Ballina Roadside Vegetation Management Plan.	High	All BSC Units	2012 onward	**Note specific attention required at sites where land holders have registered for NON-herbicide use**
3.3		Install GPS units in cabs of roadside maintenance machinery as automated warning system for sites.	Medium	BSC	ASAP	
3.4		Review Council slashing/grading schedule annually to accommodate seasonal changes to determine need and the best time and frequency of slashing/grading.	Medium	BSC	2012 onward	
3.5		Review Council roadside herbicide spraying schedule annually to determine best time and frequency.	Medium	BSC	2012 onward	
3.6	**Roadside marker System**	Design and install a signpost system for significant roadside areas (Threatened Species, Endangered Ecological Communities, heritage sites etc.)	High	BSC	2012 onward	See Section 4.3.2 and 4.3.3 for details
3.7		Consult with staff, contractors, adjoining landholders and other relevant stakeholders of significance of roadside marking.	High	BSC	2012 onward	
3.8		Where appropriate, publicise "significant roadside area" sites as part of roadside education program.	Medium	BSC	2012 onward	
3.9		Maintain a Roadside Marker System Register and a Roadside Significant Sites Register	medium to high	BSC	2012 onward	
3.10	**Active Vegetation Management**	Encourage regeneration and rehabilitation by undertaking active management (e.g. weed control) at priority sites.	High	BSC	2012 onward	e.g. High Conservation Value sites base work on sites in Actions 2.3 and 2.4
3.11		Undertake opportunistic weed control to reduce future liabilities associated with increased removal costs.	Medium	BSC	2012 onward	See section 3.5.3.. Include areas not accessible by mechanical control e.g. behind safety barriers
3.12		Monitor sites of recent works for re-growth or new growth of weeds and undertake follow up control as necessary.	High	BSC	2012 onward	
3.13		Involve Landcare & Community groups in the rehabilitation of roadside vegetation.	Medium to high	BSC	2012 onward	Offer incentives, materials, assist with grants etc.

Table 11 (con): Actions for the Implementation of the Ballina Roadside Vegetation Management Plan (con)

Training, Liaison, Promotion and Communication

Action No.\	Activity Type	Actions	Priority	Who	Time	Comment
4.1	**Training**	Distribute Operations Map and Field Kit to all roadside management staff and contractors.	High	BSC	2012	
4.2		Provide a training course on roadside vegetation management to all road construction and maintenance workers and contractors. Course content to be developed by BSC with assistance of the RMS Roadside Environment Committee.	High	BSC RMS-REC	2012	See Section 4.4.2. Training to include • How to use the Field Guide / Handbook • Interpretation of Operations Map • Machinery hygiene • Threatened species & vegetation ID
4.3		Distribute Roadside Vegetation Plan and/or Field Kit to roadside Utility Service providors and bring attention to recommendation and guidelines.	High	BSC	2012	Ensure awareness and understanding of management agreement.
4.4		Prepare a Field Guide for Roadside Construction and Maintenance activities.	Medium	BSC	2012 onward	Incorporate environmental practices from existing documentation eg ARRB and AusRoads.
4.5		Prepare and distribute Report Forms to maintenance staff.	High	BSC	2012	Circulate forms in Field Kit.
4.6		Undertake field staff training to increase awareness and recognition skills of heritage items and issues.	Medium to high	BSC	2013 onward	Items such as indigenous artifacts. mounds, middens, surface scatters, tools, etc
4.7	**Promotion**	Distribute, promote and publicise The BRVMP to Council (elected members and staff), roadside management agencies and the community	High	OS&R	2012	
4.8		Promote the BRVMP to the public and advise landholders of the importance of roadside vegetation and its values.	Medium	BSC	2012 onward	In particular landholders adjoining significant roadside vegetation sites
4.9		Promote high profile invasive weeds which pose the greatest threat to roadside vegetation to public.	Medium	BSC	2013 onward	E.g. Madeira Vine, Cats Claw Creeper
4.10		Develop incentives to encourage good management practices on high & medium conservation value roadsides.	Medium	BSC	2013 onward	
4.11		Develop guidelines on native plants present and suitable for planting on roadsides for distribution to landholders, road workers and utilities.	Medium	BSC	2014	E.g. On threatened and valuable understory species

Table 11 (con): Actions for the Implementation of the Ballina Roadside Vegetation Management Plan (con)

Training, Promotion and Communication (con)

Action No.\	Activity Type	Actions	Priority	Who	Time	Comment
4.11	**Communications and Liaison**	Continue liaison with Jali Aboriginal Land Council, elders, custodians re significant Aboriginal sites and items within the road reserve and their appropriate management.	High	BSC	2012 on	
4.12		Liaise with landholders registered with non-herbicide usage adjacent to their properties.	High	BSC	2012 on	See section 3.5.2 (d) and 4.4.4
4.13		Liaise with landholders desirous of maintaining roadside vegetation adjoining their properties.	Medium to high	BSC	2012 on	
4.14		Forward weed layer data from the Ballina Roadside Vegetation Survey to Far North Coast Weeds.	High	IT	2012	Request control of noxious weeds identified in BRVS "weed layer". See Table A.4.8 in Appendices.
4.15		Identify and implement means of increasing community involvement in roadside vegetation management.	Medium	OS&R	2013	e.g Angels Beach (East Ballina) and Tuckombil Care groups
4.16		Identify opportunities for coordinated roadside vegetation management with neighbouring Councils.	High to medium	BSC	2012 on	E.g : Coast Rd, Pearces Creek Road Midgen Flats Road, Cowlong Road
4.17		Develop joint management for roadsides that adjoin areas of significant vegetation on Crown Land.	High to medium	BSC	2012 on	E.g. Lands Department and National Parks)
4.18		Identify opportunities for creating linkages with the RMS re management of vegetation on state highways.	High to medium	BSC	2012 on	Note areas of high weed infestation e.g. Pacific Highway, Pimlico.

Monitoring and evaluation - See Section 4.7 for additional details on Monitoring

Action No.\	Activity Type	Actions	Priority	Who	Time	Comment
5.1	**Monitoring and evaluation**	Monitor and evaluate implementation of the BRVMP. Conduct random audits of roadside maintenance impact on native vegetation to instill an increased awareness amongst staff	Medium	BSC	Late 2013 on	Inform field staff of audit results and provide feedback on performance
5.2		Monitor long term effects of roadside spraying on emerging weed species and herbicide resistance.	Medium	BSC	2012 on	
5.3		Review the BRVMP every three (5) years and update.	Medium	BSC	2017	
5.4		Review outcomes of 'Integrated Weed Management' and 'Integrated Roadside Vegetation Management' programs.	Medium to low	BSC	2015	

4.7 Monitoring

To measure the success of the BRVMP recommendations in regard to enhancing native vegetation will require regular monitoring. The following performance indicators will provide useful data.

Desired Outcome	**Performance Indicator**	**Methods of monitoring indicators**
Recommended road maintenance management practices in place	• Roadside Vegetation Management Group formed and active • Increased awareness re native roadside vegetation amongst planning, design and field staff • Roadside marker system in place • Recommended maintenance practices adopted, 'vegetation treatments' in place. • Engineering works undertaken as per BMPs • Regeneration works commenced and active in high priority areas	- Establish photo-points prior to change in management regime - Establish transect/quadrats at high conservation sites - Re - survey roadside vegetation in strategic locations after 2 to 3 years - Review budget allocation in relation to biodiversity outcomes
Increased biodiversity within Shire	• Increase in extent of condition of HCV roadside vegetation • Protection of threatened species • Decrease in level of weed infestation	
Increased appreciation and cooperation by community in roadside vegetation management	• Publicity in place • Positive response to publicity • Roadside maintenance in sensitive areas undertaken by landholders • Weed control and vegetation works undertaken on private property adjacent to roadsides	-Survey (verbal and/or written) landholders, Landcares, Council staff, general community

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Useful Websites for Roadside vegetation management

http://www.wsdot.wa.gov/maintenance/vegetation/

http://www.arrb.com.au/index.php
With over 40 years of independent road and transport research, ARRB Group (formerly ARRB Transport Research) creates, applies and transfers knowledge

http://www.rta.nsw.gov.au/environment/roadsideenvironcommittee/
The web-site of the NSW Roads Transport Authority Roadside Environment Committee

Integrated Vegetation Management

http://www.uni.edu/irvm/index.html

http://www.gov.ns.ca/tran/vegetation/pdf/RVManagement%20Manual.pdf

Glossary of Terms

Aesthetic : A general term referring to visual appearance and its human perception.

Aesthetic quality: The value placed on a vegetation because of its visual significance.

Archaeological significance: Sites of Aboriginal importance (e.g. scar trees, camp site, midden, relics).

Batter: The uniform slope of a cutting or an embankment expressed as a ratio of 1 unit vertical on 'x' units horizontal.

Best Management Practice: The practices that result from decisions made on the best available information.

Biodiversity: The variety of all life-forms; plants, animals, mico-organisms, the genes they contain and the ecosystems of which they form a part.

Bioregion: To improve natural resource management in Australia, a national framework of Bioregions exists. Bioregions recognize the ecological and biophysical characteristics of the landscapes and provide a natural framework for management.

Biogeographical province: or Biogeographic regions – depict the patterns of ecological characteristics in the landscape and provide a meaningful natural framework to address landscape management and biodiversity issues. Bioregions reflect underlying environmental features such as topography, soil type and rainfall and so they often reflect patterns of land use and natural resource-based activities (including conservation).

Carriageway : The portion of the road formation, including lanes, auxiliary lanes and shoulders that is set aside for the use of vehicles, either moving or stationary.

Clearance : lateral distance from the edge of the outer lane (traveled way) to a roadside object or feature.

Conservation Value: Value (high, medium or low) given to roadsides based on assessment that examines roadside width, fauna habitat, degree of regeneration, wildlife corridor, weed cover, site disturbance and presence of rare/flora and fauna species and/or communities.

Conservation Status: Refers to Bioregional Conservation Status and is based on the level of depletion and rarity of vegetation types (ecological vegetation classes).

Corridor or Wildlife corridor – Continuous or semi-continuous patches of vegetation forming liked habitat, especially between larger or more critical habitat areas for wildlife species (links local and/or regional areas).

Cultural heritage : The value attached to the significance of human events and associations.

Critical Habitat: Habitat declared under part 3 pf the threatened Species Conservation Act 1995; or habitat declared under Division 3 of Part 7a of the fisheries Management Act 1994.

Degradation: Any human-induced decline in the quality of natural resources or the viability of ecosystems.

Drip Line: The outer extent of a trees canopy

Ecology : The science and understanding of the value and relationship between plants and animals

Ecological Vegetation Class: A mapping unit used to describe groups of plants which occur together in similar environments. Several EVCs exist in any one Bioregion.

Ecosystem: Community of organisms, interacting with one another, plus the environment in which they live and with which they interact.

Edge Effects: Describes the change in environmental conditions such as light, drainage, and wind effects which occurs when a new edge is created at the boundary of a vegetated area.

Enhancement: Introduction of flora species to a place where those species already exist.

Endangered: Species in danger of extinction whose survival is not likely in the absence of threat abatement.

Environmental Weed: A plant that colonises natural vegetation and threatens conservation values. It can be an exotic or native plant that is not indigenous to the area. They are so called, because their presence is in some way detrimental to the natural environment.

European historical sites: Sites of European significance (e.g. avenue of honour, monuments, structures such as buildings or fences).

Exotic : Plant species of foreign origin or character introduced from aboard, not native to Australia.

Fauna : Refers to animals, both individually and collectively.

Flora : Refers to plants, both individually and collectively.

Fuel Reduced Corridor: Assist to reduce the intensity of fire, enable establishment of control lines and provide a clear traffic route.

Fuel Reduced Zone: Area of minimum fuel or vegetative hazard that is maintained in a fuel reduced condition to the extent that the passage of fire will be restricted (eg. Short green lawn, paths, driveway)

Genetic diversity: Occurrence of genetic differences between individuals.

Grazing: Confinement of stock for extended periods for the purpose of depasturing the road reserve.

Grazing of Stock: Using a particular area for grazing rather than for droving or movement of livestock.

Habitat: Place or environment in which specified organisms live.

Heritage Listed: an item listed on the State heritage register under the NSW Heritage Act 1977, an item listed on heritage schedules or in “special character areas on local and regional environmental plans (LEPs and REPs) and development control plans (DCPs) prepared under the NSW Environmental Planning and assessment Act 1979; an item listed on the regisiter of the National Estate by the Australian heritage Commission and classified by the Nation Trust of Australia

Indigenous: Indicating an organism native to a particular locality or habitat.

Integration : The assimilation of an element with its environment, usually with minimum contrast and maximum compatibility.

Introduced plants: All plant species that are not natural to the area (not present prior to European settlement).

Landscape : An holistic term that encompasses visual, ecological and cultural values of the physical environment.

Landscape character: The quality image or feel of a landscape that is created by a particular mix of elements.

Landuse: Activity occurring on parcels of land (e.g. farming, grazing, residential, forestry).

Movement of Stock: Movement of stock (during daylight hours and not less than one km per hr) as part of normal farming practices on a regular basis from one paddock to another or on an occasional basis from one paddock or property to another.

Native Vegetation: Plants (including trees, shrubs, understory plants, groundcovers, herbs and grasses) which are indigenous to an area.

Naturally propagated: vegetation that has been naturally propagated, including by birds or other animals.

Net Gain Net: Gain is a reversal across the entire landscape of the decline in the extent and quality of native vegetation.

Non Declared or Local Road: Roads that are managed and maintained by Council.

Noxious Weed: **:** A weed that is declared as being noxious under legislation (Noxious Weeds Act 1993)

Open forest : As used by Specht et al. (1970) for Australian plant communities where the projective foliage cover of the vegetation is mid-dense (30-70%).

Pest Plants (See weeds)

Priority Access Road: A road that is critical for an ensured transport route for travellers and provides a link between critical locations to reduce travel time for fire fighters.

Rare: A species that characteristically has a limited distribution and/or abundance due to the specificity of their habitat requirements or that has a limited distribution and abundance because habitat resources have been modified or lost.

Regeneration: New growth of indigenous flora species where the dominant species of the pre-existing vegetation type is reestablished.

Regrowth: naturally propagated saplings, seedlings, suckers and other vegetation, either native or exotic, which has re-grown (in the road reserve) after previous control works **or tree shoots that grow back into clearance space after a plant has been pruned.**

Remnant Vegetation: Remaining native vegetation, native vegetation that remains in much the same form and composition in the same location since European settlement.

Riparian : Vegetation naturally associated with a river or creek system.

Roadside landscape: The space between the carriageway of a road and the outer edge of the road easement.

Roadside Biological Corridor: Native roadside vegetation, usually of higher conservation value, which connects blocks of remnant vegetation, provides a strategic link for wildlife

Road Formation That portion of the road reserve along which vehicles travel. It includes the road pavement, shoulders and the area to the outermost side of the roadside drain, at least to where the drain batter meets the natural surface. This area includes the table drain.

Road Reserve: The total strip of land reserved for transportation purposes, usually bordered by property boundaries, from fence line to fence line or boundary to boundary if unfenced. The road reserve usually consists of a central road formation bounded by roadsides.

Road shoulder: -The area on a sealed road between the edge of the seal and the road verge.

Roadside The strip of land that supports vegetation between the road formation and the boundary of the road reserve, which is usually also the boundary of the adjacent property.

Road surface : The finished level of the road; the visible and navigable plane of the road.

Road verge: the are between the edge of the carriage way or the edge of the shoulder and the vegetation.

Sedimentation: the consolidation of material carried by wind or water.

Seed bank: Volume of seed contained in the soil that is still viable and ungerminated.

Shoulder : The portion of the carriageway, measured from the outside edge of the outer traffic lane, adjacent to and flush with the surface of the traffic lane. The shoulder excludes any berm, verge, rounding or extra width that is provided for the installation of sign posts.

Sites of Significance: Sites of either cultural, historical or conservation significance.

Sight Distance ; The distance required to provide the motorist adequate time to observe the road layout in sufficient time to react, and stop if necessary, before entering the conflict zone

Stratum: Indicates the vertical layer of a community. Includes the dominant overstorey of trees, the understorey of shrubs and the lower groundcover or grasses.

Threatened: The generic term used to describe taxa (species) that are rare, vulnerable, endangered or insufficiently known and are subject to threatening processes.

Travelled Way: The portion of the carriageway that is assigned to moving traffic, excluding shoulders and parking lanes.

Undeveloped road:- A road rederve not developed for the passage of vehicles.

Unused Road Reserve: A road that has been gazetted under the Crown Lands Act where it is not used for public traffic. DPI then becomes the responsible authority.

Upperstorey: The upperstorey includes plant species occurring in the top strata of a vegetation alliance. The strata contains predominantly self supporting trees which are plants with a main stem and woody branches.

Vegetation Association: A plant community dominated by a particular species and named according to them. The association assemblage of species that recurs under comparable ecological conditions in different places.

Vegetation Community: Describes an assemblage of flora populations living in a prescribed area or physical habitat, inhabiting some common environment.

Verge : The are located between the outer edge of the shoulder and the batter hinge point, used for the purpose of providing drainage, safety barriers and rounding.

Vulnerable: Species likely to become endangered in the short term if threatening processes continue.

Weed: A plant that is growing where it is not wanted (can be native or non-native, usually introduced) which poses a threat to other vegetation and the environment, usually by way of its invasive habit, to the determent of endemic plants.and/or agricultural crops.

Windbreak: Line of trees or vegetation which provides wind protection.

movement and serves as a gene pool for flora.

Compiled from: RCAC Roadside Assessment
Benalla Roadside Vegetation Plan, Kyogle Council Roadside Vegetation Management Plan
Queensland Main Roads Glossary
Kyogle Roadside Vegetation Management Plan , GeoLink 2002

http://www.mainroads.qld.gov.au/web/AttachStore.nsf/allobjects/Road%20Landscape%20Manual%20-%20Glossary/$file/RLM_Glossary.pdf

Roadside Vegetation Categories

Conservation Zone
Vegetation near to its natural condition. Few introduced species. All storeys of vegetation are well represented. Good wildlife habitat and/or provides corridor lineages

High Recovery Zone
Vegetation in a semi-natural condition. Mostly native vegetation but with moderate invasion of introduced species. One or more stories of vegetation may be missing. Wildlife habitat could be enhanced.

Highly Modified Zone
Degraded or substantially modified areas. Minimal indigenous vegetation. Dominated by introduced species. Little habitat value.