

NOTICE OF MEETING



BIODIVERSITY AND SUSTAINABILITY ADVISORY COMMITTEE MEETING

A Biodiversity and Sustainability Advisory Committee Meeting of Byron Shire Council will be held as follows:

Venue	Conference Room, Station Street, Mullumbimby
Date	Thursday, 21 April 2016
Time	9.00am

A handwritten signature in black ink, appearing to read 'Shannon Burt', is located below the meeting details.

Shannon Burt
Director Sustainable Environment and Economy

I2016/308
Distributed 8/04/16

CONFLICT OF INTERESTS

What is a “Conflict of Interests” - A conflict of interests can be of two types:

Pecuniary - an interest that a person has in a matter because of a reasonable likelihood or expectation of appreciable financial gain or loss to the person or another person with whom the person is associated.

Non-pecuniary – a private or personal interest that a Council official has that does not amount to a pecuniary interest as defined in the Local Government Act (eg. A friendship, membership of an association, society or trade union or involvement or interest in an activity and may include an interest of a financial nature).

Remoteness – a person does not have a pecuniary interest in a matter if the interest is so remote or insignificant that it could not reasonably be regarded as likely to influence any decision the person might make in relation to a matter or if the interest is of a kind specified in Section 448 of the Local Government Act.

Who has a Pecuniary Interest? - a person has a pecuniary interest in a matter if the pecuniary interest is the interest of the person, or another person with whom the person is associated (see below).

Relatives, Partners - a person is taken to have a pecuniary interest in a matter if:

- The person's spouse or de facto partner or a relative of the person has a pecuniary interest in the matter, or
- The person, or a nominee, partners or employer of the person, is a member of a company or other body that has a pecuniary interest in the matter.

N.B. “Relative”, in relation to a person means any of the following:

- (a) the parent, grandparent, brother, sister, uncle, aunt, nephew, niece, lineal descends or adopted child of the person or of the person's spouse;
- (b) the spouse or de facto partners of the person or of a person referred to in paragraph (a)

No Interest in the Matter - however, a person is not taken to have a pecuniary interest in a matter:

- If the person is unaware of the relevant pecuniary interest of the spouse, de facto partner, relative or company or other body, or
- Just because the person is a member of, or is employed by, the Council.
- Just because the person is a member of, or a delegate of the Council to, a company or other body that has a pecuniary interest in the matter provided that the person has no beneficial interest in any shares of the company or body.

Disclosure and participation in meetings

- A Councillor or a member of a Council Committee who has a pecuniary interest in any matter with which the Council is concerned and who is present at a meeting of the Council or Committee at which the matter is being considered must disclose the nature of the interest to the meeting as soon as practicable.
- The Councillor or member must not be present at, or in sight of, the meeting of the Council or Committee:
 - (a) at any time during which the matter is being considered or discussed by the Council or Committee, or
 - (b) at any time during which the Council or Committee is voting on any question in relation to the matter.

No Knowledge - a person does not breach this Clause if the person did not know and could not reasonably be expected to have known that the matter under consideration at the meeting was a matter in which he or she had a pecuniary interest.

Participation in Meetings Despite Pecuniary Interest (S 452 Act)

A Councillor is not prevented from taking part in the consideration or discussion of, or from voting on, any of the matters/questions detailed in Section 452 of the Local Government Act.

Non-pecuniary Interests - Must be disclosed in meetings.

There are a broad range of options available for managing conflicts & the option chosen will depend on an assessment of the circumstances of the matter, the nature of the interest and the significance of the issue being dealt with. Non-pecuniary conflicts of interests must be dealt with in at least one of the following ways:

- It may be appropriate that no action be taken where the potential for conflict is minimal. However, Councillors should consider providing an explanation of why they consider a conflict does not exist.
- Limit involvement if practical (eg. Participate in discussion but not in decision making or vice-versa). Care needs to be taken when exercising this option.
- Remove the source of the conflict (eg. Relinquishing or divesting the personal interest that creates the conflict)
- Have no involvement by absenting yourself from and not taking part in any debate or voting on the issue as if the provisions in S451 of the Local Government Act apply (particularly if you have a significant non-pecuniary interest)

RECORDING OF VOTING ON PLANNING MATTERS

Clause 375A of the Local Government Act 1993 – Recording of voting on planning matters

- (1) In this section, **planning decision** means a decision made in the exercise of a function of a council under the Environmental Planning and Assessment Act 1979:
 - (a) including a decision relating to a development application, an environmental planning instrument, a development control plan or a development contribution plan under that Act, but
 - (b) not including the making of an order under Division 2A of Part 6 of that Act.
- (2) The general manager is required to keep a register containing, for each planning decision made at a meeting of the council or a council committee, the names of the councillors who supported the decision and the names of any councillors who opposed (or are taken to have opposed) the decision.
- (3) For the purpose of maintaining the register, a division is required to be called whenever a motion for a planning decision is put at a meeting of the council or a council committee.
- (4) Each decision recorded in the register is to be described in the register or identified in a manner that enables the description to be obtained from another publicly available document, and is to include the information required by the regulations.
- (5) This section extends to a meeting that is closed to the public.

BYRON SHIRE COUNCIL
BIODIVERSITY AND SUSTAINABILITY ADVISORY COMMITTEE MEETING

BUSINESS OF MEETING

1. APOLOGIES

2. DECLARATIONS OF INTEREST – PECUNIARY AND NON-PECUNIARY

3. ADOPTION OF MINUTES FROM PREVIOUS MEETINGS

3.1 Biodiversity and Sustainability Advisory Committee Meeting held on 18 February 2016

4. BUSINESS ARISING FROM PREVIOUS MINUTES

5. STAFF REPORTS

Infrastructure Services

5.1 Byron Shire Integrated Weed Management Strategy4

STAFF REPORTS - INFRASTRUCTURE SERVICES

Report No. 5.1 **Byron Shire Integrated Weed Management Strategy**
Directorate: Infrastructure Services
5 **Report Author:** Andrew Erskine, Open Space Technical Services Officer
File No: I2016/280
Theme: Community Infrastructure
10 Asset Management

Summary:

15 Consultants and staff have developed a Shire Wide Integrated Weed Management Strategy for Council owned and managed lands as per Council resolution 13-621.

RECOMMENDATION:

That the Biodiversity and Sustainability Advisory Committee review the draft Byron Shire Integrated Weed Management Strategy.

Attachments:

20 1 Byron Shire Integrated Weed Management Strategy (Draft), E2016/16207 , page 7

Report

The draft Byron Shire Integrated Weed Management Strategy (Strategy) was last reported to the Biodiversity and Sustainability Committee at the 6 August 2015 meeting.

At this meeting the Committee recommended and Council resolved:

Resolution 15-434 that Council adopt the following Committee Recommendations:

Committee Recommendations 5.1.1

1. That Biodiversity and Sustainability Committee note the report
2. That the definition of integrated weed management and the objectives within the strategy be reviewed with further input from Committee members and suggested experts/others.

Since last reported the Strategy (Attachment 1) has undergone a number of reviews between staff, industry experts and the consultants and is considered now ready for final review by the Biodiversity and Sustainability Advisory Committee before reporting to Council.

Table 1 lists the key steps in the development of the Strategy and future actions required post the Committees review.

Table 1 – Integrated Weed Management Strategy project timeline

Date	Activity	Status
24 March	Staff Working Group meeting 1 – engage consultants	Complete
23 April	Workshop 1 – Council Staff	Complete
14 May	Workshop 2 - Biodiversity and Sustainability Committee workshop	Complete
16 May	Workshop 3 – Landcare and Dunecare volunteers	Complete
May	Consultation with Far North Coast Weeds	Complete
29 May	Draft Strategy V1 submitted to Council staff	Complete
8 June	Staff working group meeting 2 – discussion of Draft V1	Complete. Feedback provided to AWC
1 July	Progress report to Executive Team	Complete
21 July	Strategy V2 submitted to Council staff	Complete
29 July	Report draft Strategy to Executive Team	Complete
6 August	Progress report to Biodiversity and Sustainability Committee	Complete

BYRON SHIRE COUNCIL

STAFF REPORTS - INFRASTRUCTURE SERVICES

5.1

Date	Activity	Status
August	Staff working group meeting 3 – consider resource implications of draft Strategy	Complete
April 2016	Report Draft Strategy to Biodiversity and Sustainability Advisory Committee	We are here
TBA	Report Draft Strategy to Council seeking approval for public exhibition	Pending
TBA	Public exhibition (minimum 28 days)	Pending
TBA	Review Submissions	Pending
TBA	Staff working group meeting 4 – discuss submissions and final amendments to Strategy	Pending
TBC	Final Strategy submitted to Council	Pending
TBC	Final Strategy reported to Council for adoption	Pending

Financial Implications

- 5 Not yet analysed.

Statutory and Policy Compliance Implications

Detailed in Attachment 1.



BYRON SHIRE COUNCIL



DRAFT Integrated Weed Management Strategy

Prepared by Australian Wetlands Consulting

DRAFT Byron Integrated Weed Management Strategy

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Project control

Project name: **Byron Shire Integrated Weed Management Strategy**

Job number: 1-15546d
 Client: Byron Shire Council
 Contact: Andy Erskine

Prepared by: Australian Wetlands Consulting Pty Ltd

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Date:	Revision:	Prepared by:	Reviewed by:	Distributed to:
11.05.2015	A	Ian Colvin, Darren McHugh	Unreviewed working draft (Parts 1 & 3 only)	Angus Underwood
29.05.2015	B	Ian Colvin, Darren McHugh	Damian McCann	Angus Underwood
20.07.2015	C	Ian Colvin, Darren McHugh	Damian McCann	Angus Underwood
9.02.2016	D	Ian Colvin, Darren McHugh	Rebecca Smith	Andy Erskine

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Table of Abbreviations

Abbreviation	Meaning
APVMA	Australian Pesticides and Veterinary Medicines Authority
BBCS	Byron Biodiversity Conservation Strategy
BSC	Byron Shire Council
BVL	Brunswick Valley Landcare
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
FNCW	Far North Coast Weeds
IWM	Integrated Weed Management
KTP	Key Threatening Process
LCA	Local Control Authority
MM	Metsulfuron-methyl
MoU	Memorandum of Understanding
PPE	Personal Protective Equipment
PUNP	Pesticide Use Notification Plan (2007)
TSC Act	<i>Threatened Species Conservation Act 1995</i>
WHS	Work, Health & Safety
WoN	Weed of National Significance

Executive Summary

This *Integrated Weed Management Strategy* ('the Strategy') has been prepared for Byron Shire Council to implement Resolution 13-621 which aspires to eliminate the use of chemical herbicides and the repetitive use of all chemical herbicides within high-use areas of public space within Byron Shire, within five years. The Strategy has completed an audit of the methods used by Council staff and contractors with regard to where herbicides are used, how it is used, what herbicides are used (and how much is used) and examined potential alternative methods for weed control where more benign alternatives to chemical herbicides may be utilised.

The Strategy recognises there is a range of competing interests regarding herbicide use – such as obligations for controlling noxious weeds, maintaining a safe roadside environment, maintaining sportsfields and playgrounds, maintaining infrastructure and utilities and managing biodiversity.

Following a review of information and discussion with Council staff it is evident that elimination of chemical-based herbicide use in high use public areas cannot be achieved for the following reasons:

- Turf maintenance in grade A couch sportsfields cannot currently be achieved without the use of selective herbicides, and
- Where unusual circumstances occur and weed control within a high use public area cannot be achieved under the strategy of reduced herbicide use above, there may be a need to use chemical based herbicides to maintain open space, utilities and assets to an expected standard.

Nevertheless the actions prescribed in the Strategy represent an aspiration to reduce the use of chemical-based herbicides and adopt best practice management to improve future outcomes in weed control.

Four key targets were chosen to guide strategic actions:

1. Reduce chemical herbicide use in high use public areas within the next 5 years.
2. Seek to reduce chemical herbicide use in other areas where weed control occurs.
3. Seek to achieve best practice weed management through implementation of an integrated approach to weed control and vegetation management.
4. Improve community engagement and knowledge through proactive communication and transparency.

To meet these targets a number of actions have been prescribed (refer Part 2 of the Strategy). By implementing these actions over a five year period it is envisaged that Council can reduce herbicide use, improve current methods and integrate best practice to delivering good outcomes for the public, the environment and Council.



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Part 1

Introduction and Management Context



1 Introduction and background

Australian Wetlands Consulting (AWC) has prepared this *Integrated Weed Management Strategy* (IWMS, 'the Strategy') on behalf of Byron Shire Council to provide an overview of Councils current weed management methods with an objective to reduce and minimise the use of chemical based herbicides. The IWMS aims to provide a framework and action plan for an integrated approach to weed management works on Council managed lands and has been prepared in order to improve the efficiency of current weed management methods and address growing community concern regarding the health impacts of herbicide usage.

1.1 Councils vision for Integrated Weed Management in Byron Shire

At Councils meeting on 21 November 2013, a resolution [Resolution 13-621] was passed to develop a Shire Wide Integrated Weed/Pest Management Policy and Strategic Action Plan for Council owned and managed lands in consultation with Council staff, community and experts in the field (refer overleaf).

The vision of the Integrated Weed/Pest Management Policy included:

- a) *An aspiration to reach the goal of ceasing the use of all non-organic chemical based herbicides and the repetitive use of all non-organic chemical pesticides, in highly frequented, public use areas, within 5 years.*
- b) *Consideration that non organic chemical herbicides are the least preferred, though currently are, at times essential management option, and the process of managing weeds and controlling vegetation should be undertaken in a way that minimises adverse effects.*
- c) *Promotion of the concept of best practice weed management, taking an integrated approach to the control of weeds and vegetation, and uses methods that have the least potential to adversely affect human health and the environment while achieving the desired outcome.*
- d) *A statement outlining desired outcomes of the Policy.*



Council Resolution 13-621

1. *That Council develop a Shire Wide Integrated Weed/Pest Management Policy for Council owned and managed lands, and a Shire Wide Integrated Weed/Pest Management Strategic Action Plan for Council owned and managed lands in consultation with Council staff, community and experts in the field.*

2. *That the following are included within the vision of the Integrated Weed/Pest Management Policy:*

- a) *An aspiration to reach the goal of ceasing the use of all non-organic chemical based herbicides and the repetitive use of all non-organic chemical pesticides, in highly frequented, public use areas, within 5 years.*
- b) *Consideration that non organic chemical herbicides are the least preferred, though currently are, at times essential management option, and the process of managing weeds and controlling vegetation should be undertaken in a way that minimises adverse effects.*
- c) *Promotion of the concept of best practice weed management, taking an integrated approach to the control of weeds and vegetation, and uses methods that have the least potential to adversely affect human health and the environment while achieving the desired outcome.*
- d) *A statement outlining desired outcomes of the Policy.*

3. *That an Integrated Weed and Pest Management Strategic Action Plan considers:*

- a) *A non-organic chemical use audit for weed control, including an outline of where it is used, the types used and the current budget of use.*
- b) *Increasing native plantings as a method of weed control.*
- c) *An updated report every two years outlining progress of the goal of ceasing the use of all non-organic chemical based herbicides and the repetitive use of non-organic chemical pesticides, within 5 years, impediments to this target and possible options that have arisen and that this report compares the relative environmental costs & benefits.*
- d) *Within a review, the investigation of different possible management options, within different areas and ecosystems and a prioritisation of areas to be targeted.*
- e) *Possible cooperation with Universities for selecting waterway sites to monitor and test the impacts of using non organic chemicals, possibly as a research project as a case study.*
- f) *Investigation of further opportunities to make significant reductions in non-organic chemical use, for example, rate incentives for organic farmers and subsidising responsible non organic chemical use training for farmers.*
- g) *Investigation of using one park or open space within the Shire as a 'trial park' to engage community support and test non chemical methods.*



1.2 Aims and objectives

The Strategy responds to concerns of the community regarding the use of chemical herbicides and potential negative impacts on human health and the environment. Council is committed to addressing community concerns regarding herbicide use in public areas and their potential negative health effects and is similarly committed to biodiversity conservation and the sustainable management of the natural environment and its resources. As such, in accordance with Resolution 13-621 the aim of the Strategy is:

To effectively manage weeds on Council managed lands using an integrated approach which protects biodiversity, infrastructure and aesthetic values.

Objectives of the Strategy are as follows:

1. To reduce the impact of existing weeds on the natural and build environment and prevent the establishment of new weeds.
2. Improve understanding of weed ecology in order to improve weed management techniques.
3. Evaluate suitable weed management techniques for Council to use as part of an Integrated Weed Management Strategy.
4. Eliminate the use of chemical herbicide in *high use public areas* by 2018 and reduce the use of chemical herbicide based on 2014 data across all other lands managed by Council.
5. Increase community awareness, education and participation in weed management.

1.3 Definitions

Definitions of organic and non-organic chemical based herbicides (as cited in the Resolution) have been allocated with regard to the Strategy as follows:

Organic chemical based herbicides: Chemical herbicides which contain constituents considered as 'naturally' occurring. Note: this category does not imply that these herbicides are compliant with registered organic certification.

Non-organic chemical based herbicides: Chemical herbicides which contain chemical constituents and which are registered with the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Note that these definitions do not allude to the toxicity of any herbicides with regard to human and/or environmental health. Further, many organic chemical-based herbicides are also registered products with the APVMA.

The term '**highly frequented, public use area**' (as per the Resolution) requires further definition, and for the purpose of the Strategy is adopted as:

Areas of public land established and maintained for which the primary purpose allows or promotes a high level of use by the community.



A summary of the places which comprise highly frequented, public use areas is shown at Table 1.1.

Table 1.1 Examples of highly frequented, public use areas

Public place	Typical user groups
Parks* and garden beds	<ul style="list-style-type: none"> general recreational users (e.g. picnickers and joggers) all ages and social groups
Picnic tables and park shelters	<ul style="list-style-type: none"> general community
Playgrounds	<ul style="list-style-type: none"> children and other family members
Sporting fields and ovals, golf course	<ul style="list-style-type: none"> children general sports participants informal use by all ages
Swimming pools	<ul style="list-style-type: none"> children general community formal and informal training (all ages)
Urban infrastructure (within CBD)	<ul style="list-style-type: none"> general community

***Note: Only applies to a designated park with facilities/infrastructure intended for use/recreation. Does not include parks which are vacant land (either cleared or vegetated) which are not specifically intended for recreational use.**

Finally, the definition of Integrated Weed Management (IWM) adopted by the federal government has been adopted for the Strategy as follows:

Integrated weed management (IWM) is the control of weeds through a long-term management approach, using several weed management techniques such as physical control, chemical control, biological control and cultural control.

The advantages of IWM are based on using several techniques for weed control, therefore reducing the likelihood that weeds may adapt to specific control methods. Any integrated weed management plan or strategy should focus on the most economical and effective control of the weeds and include ecological considerations. A long term approach to IWM should aim to reduce the extent of weeds and reduce weed seed stock in the soil and consider how to achieve this goal in a sensitive manner.

Council already practice integrated weed management through the use of a range of different weed control techniques. This Strategy will formalise and improve the current management approach and will also emphasise the use of herbicide as the least preferred (but at times necessary approach) to managing weeds.

1.4 Consultation

The Strategy has been prepared in consultation with Council staff and a number of individuals and groups, with the consultation process including:

1. Meetings with the project Steering Committee comprising various Council staff within different divisions.
2. Meetings with Councils Biodiversity Sustainability Advisory group.



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3. A workshop with landcare/dunecare and volunteer groups.
4. Presentation to Councilors prior to Public Exhibition.

An initial workshop with the Steering Committee was an opportunity to 'set the scene' for the Strategy and brought together a range of Council personnel from the Infrastructure Services and Sustainable Environment and Economy departments to discuss existing approaches and how the Strategy might be developed. The following key points came out of this first meeting:

1. Key challenges for staff in both departments were costs and resources.
2. Challenges occurred on public spaces and sports fields (and the ability to 'keep up'), road verges and guardrails, riparian areas and Sewage treatment Plants (STPs).
3. A variety of weed species were identified as demanding most resources, including woody weeds, vines, Setaria, Crowsfoot Grass, Nutgrass, aquatic weeds.
4. Current management approaches include spraying, slashing and bush regeneration techniques.
5. The effectiveness of current management techniques are compromised by budgets and resources. Improvements could be made by investing in specialised equipment (e.g. for parks and gardens), the use of volunteers and more efficient use of contractors.
6. A reduction in ability to use herbicides would result in potential for increased labour (e.g. hand weeding), use of alternative herbicides, greater use of volunteers, accepting more weeds, more slashing, increased planting and better weed management prioritisation.
7. Both departments accepted that current weed management could not be achieved without using herbicide.
8. Alternative suggestions for weed control included use of pine-based products, better road design, not using pavers, use of growth retardants, further steam weeding trials.
9. Implementation of the Resolution into work requirements could be assisted by identifying high use public areas and prioritising these for hand weeding, using volunteers, participation by sports clubs, and reducing target areas.

Other outcomes from other meetings and workshops were received via discussion and or written comments and have been included in the Strategy where relevant.

Following provision of an initial draft Strategy and further amendments, this version of the Strategy has been finalised to Councils satisfaction and is available for public review and comment as part of the Public Exhibition process. Following the Public Exhibition period, all submissions will be reviewed and discussed and further amendments made to the Strategy as required.

1.5 Planning context

1.5.1 Legislation

Weed control within NSW is covered by several pieces of legislation which are relevant to this Strategy, as summarised in Table 1.2.



Table 1.2 Summary of relevant legislation

Legislation	Comments
<i>Noxious Weeds Act 1993</i>	<p>Implemented and enforced by Far North Coast Weeds (FNCW) in the northern rivers. The Act imposes obligations on occupiers of land to control noxious weeds declared for their area. Weed control classes listed in the Act and their control requirements are summarised at Table 1.3.</p> <p>To be declared a noxious weed, a number of criteria must be met:</p> <ul style="list-style-type: none"> • A weed must have potential to cause harm to people, • A weed must be able to be controlled by reasonable means, • A weed must have the potential to spread within an area and to other areas, and • The control of a weed must provide a benefit to the community over and above the cost of implementing the control program. <p>On this basis, a number of weed species perceived as being 'bad' or 'noxious' do not meet these criteria and hence are not declared. Weed declarations are reviewed on a regular basis to account for any new or emerging weeds.</p>
<i>Pesticides Act 1999</i>	<p>Requires the users of registered pesticides to strictly follow the approved label or permit directions. The Environment Protection Authority (EPA) enforces the proper use of pesticides in NSW, including those used in agriculture, on public lands and on domestic and commercial premises. The provisions of the Act are enforced by officers of the EPA.</p> <p><u>Note:</u> the Act does not apply to veterinary chemicals, which are regulated by the Department of Primary Industries (DPI).</p>
<i>Pesticides Regulation 2009</i>	<p>The Pesticides Regulation administers the following:</p> <ul style="list-style-type: none"> • Sets various fees in relation to assessments of technology and prescribed activities by the EPA and in relation to licences to carry on prescribed activities, • Specifies the matters to be included in applications for assessment of prescribed activities, in EPA notices about assessments of chemicals, and in EPA notices about applications for licences and transfers of licences, • Provides for the appointment of alternate members of the Hazardous Chemicals Advisory Committee, • Provides for the time within which certain appeals under the <i>Environmentally Hazardous Chemicals Act 1985</i> may be made, and • Prescribes the information to be included in registers under the Act. <p>It is the Regulations which requires Council to keep records of all pesticide use and provide public notification. Both these requirements are compulsory for public authorities under the Regulations.</p>
<i>Threatened Species Conservation Act 1995 (TSC Act)</i>	<p>The TSC Act lists a number of Key Threatening Process (KTP), some of which are specific to weed invasion. A KTP is listed in the TSC Act if it adversely affects threatened species, populations or ecological communities or if it could cause species, populations or ecological communities that are not threatened to become threatened. KTPs specific to weed invasion and environmental impacts within the Shire include:</p> <ul style="list-style-type: none"> • Invasion and establishment of exotic vines and scramblers, • Invasion, establishment and spread of <i>Lantana camara</i>, • Invasion of native plant communities by bitou bush and boneseed, • Invasion of native plant communities by exotic perennial grasses, and • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants. <p>The TSC Act also lists several Threat Abatement Plans (TAPs); these are approved documents prepared to:</p> <ul style="list-style-type: none"> • Outline actions to reduce or eliminate threatening processes, • Explain how the success of these actions will be measured, • Identify the authorities that will be responsible for carrying out those actions, and • Give a cost estimate and timetable, if possible, for carrying out the plan. <p>Only one approved TAP relating to weeds in NSW has been prepared, the <i>Bitou Bush and Boneseed Threat Abatement Plan</i> (DEC, 2006).</p>
<i>Roads Act 1993</i>	<p>While the Roads Act has no specific provisions for weed control, Council is required to comply with the relevant provisions of the Act when completing works within the road reserve.</p>

Table 1.3 Weed control classes and control requirements in the Noxious Weeds Act 1993

Control class	Weed type	Control requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent. e.g. Siam Weed	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent. e.g. Groundsel Bush	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. E.g. Bitou Bush	The plant must be fully and continuously suppressed and destroyed.*
Class 4	Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. E.g. Bridal Creeper	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State. E.g. Fountain Grass	There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.
* In some cases the following wording has also been inserted "the plant may not be sold, propagated or knowingly distributed."		

1.5.2 Regulatory authorities

1.5.2.1 Australian Pesticides and Veterinary Medicines Authority (APVMA)

Pesticide products sold in Australia must be approved and registered by the *Australian Pesticides and Veterinary Medicines Authority* (APVMA). Before registering a product, APVMA is required to conduct an assessment of the potential impacts of the pesticide on the environment, human health and trade, and of the likely effectiveness of the pesticide for its proposed uses. When a pesticide contains an active constituent not previously used in Australia, APVMA must seek public comment before registering the product.

Only registered pesticides can be used in NSW, unless APVMA grants approval for use under a permit. Registration includes approval of label directions for each pesticide product. Label directions specify how, and under what circumstances, the pesticide may be used to treat the relevant target pest or pests. Labels also give directions on clean-up, storage and disposal, and personal and environmental safety. After registration, APVMA regulates pesticides up to and including the point of retail sale. Once sold, pesticides are regulated by each state's control-of-use legislation.

Note: the APVMA use the blanket term 'pesticides' to include:

- Herbicides (products which kill plants),
- Insecticides (products which kill insects),
- Fungicides (products which kill fungus diseases),
- Nematicides (products which kill nematodes), and
- Molluscicides (products which kill molluscs [slugs and snails]).

1.5.2.2 Far North Coast Weeds

Far North Coast Weeds (FNCW) is the trading name for the Far North Coast County Council and covers the Local Government Areas (LGAs) of Tweed, Byron, Ballina, Lismore City, Richmond Valley and Kyogle. The aim of FNCW is to protect and enhance the environment by managing the impact of noxious weeds on all classes of land within the county district and actively encouraging best-practice techniques and land use. FNCW is the Local Control Authority (LCA) responsible for administering the *Noxious Weeds Act 1993* in the northern rivers region.

The management platform of FNCW is based on the achievement of four goals:

1. Prevent the establishment of new weed species in the region (Exclude),
2. Eliminate or prevent the spread of new weed species in the region (Eradicate or contain),
3. Reduce the impacts of widespread invasive weed species (Effectively manage), and
4. Ensure community, industry and government stakeholders have the ability and long-term commitment to manage invasive weed species (Build capacity).

While FNCW is the LCA for the Shire, it completes no targeted works on Council-owned and managed land, with the exception of noxious weed control on roadsides. While Council and FNCW liaise with regard to noxious weeds, new declarations and relevant weed management matters, FNCW principally operates outside of Councils weed management program, and hence has no direct input to determining future weed strategies for the Shire. Nevertheless as the LCA for the region, they are an important stakeholder and are included in the Strategy for this reason. The principal activities and services of FNCW are summarised at Table 1.4.



Table 1.4 Activities and services of FNCW

Role	Activities/services
Regulatory	<ul style="list-style-type: none"> • Inspection of land within the county to ensure, so far as practicable, that owners and occupiers of land (other than public authorities or other local control authorities) carry out their legislative noxious weed control obligations. • Undertaking compliance action to ensure landowners and managers meet their legislative noxious weed control obligations. • Production of Section 64 certificates under the <i>Noxious Weeds Act 1993</i>, which provide information for prospective land purchasers about any current weed control notices, expenses and charges on land.
Weed management on public lands	<ul style="list-style-type: none"> • Development of weed management plans which encompass 12,438 kilometres of roadsides across the county. • Mapping the density and distribution of declared noxious weeds on roadsides. • Carrying out control works against declared noxious weeds on the public road network throughout the county area.
Strategic control of high-priority and high-risk weed species	<ul style="list-style-type: none"> • Mapping of all declared noxious weeds on private and public lands. • Implementing inspections on private and State lands for declared weed species. • Development and implementation of collaborative control activities for high-priority declared weed species in partnership with land owners and managers. • Identification of species exhibiting weedy potential and implementing strategies for their timely control and future management. • Review and prioritisation of weed-management programs to ensure resources are directed to where benefits will be the greatest.
Education, extension and community engagement	<ul style="list-style-type: none"> • Developing programs which aim to increase the communities' acceptance of and willingness to be involved in effective weed-management programs. • Provision of advice on best-practice control methods, weed seed spread prevention and other relevant management topics. • Provision of technical support and literature to land owners, community and industry groups. • Attendance at shows and field days across the region to enhance weed-management awareness.

1.6 Council policies

1.6.1 Pesticide Use Notification Plan

Council has prepared a *Pesticide Use Notification Plan* ['PUNP'] (2007) in accordance with the requirements of the *Pesticides Regulation 2009*, which is attached in full at Appendix A. The PUNP describes how Council will notify the community of pesticides it applies (or allows to be applied via sub-contractors), to public places that it owns or controls. The PUNP specifies different types of notification (e.g. advertisement or signage) depending the type of use such as spot spraying or broad scale spraying.

The PUNP applies to outdoor public places owned/controlled by Council within the LGA, including:

- parks and garden beds,
- playgrounds,
- picnic tables and park shelters,
- caravan parks,
- road verges, road reserves, laneways, pathways and easements accessible to the public,
- sporting fields and ovals and cricket wickets,
- swimming pools,
- rivers and foreshores, excluding natural areas,
- coastal dunes, natural areas, bushland, natural wetlands, vegetated rivers and foreshores,
- drains, drainage systems and constructed wetlands,
- Myocum landfill, and
- Cemeteries.



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The PUNP summarises the level of community use, regular user groups and types of pesticide use in these categories of public places (refer Appendix A). Notification of pesticide control works is proceeded by the erection of signage, advertising, letters (including fax/email) and personal contact (telephone, door knocking). Notification of pesticide control works may be advertised on the Council's website. The notification approach will depend on weed control method e.g. spot spraying general requires local signage and broad scale spraying may require advertisement in the local newspaper.

In accordance with clause 11L(2)(g) of the *Pesticides Regulation*, notice of pesticides use must include the following information:

- The full product name of the pesticide to be used,
- The purpose of the application, clearly setting out which pest or pests are being treated,
- The proposed date/s, or date range of the pesticide use,
- The places where the pesticide is to be used,
- Contact telephone number and email address of the Council officer who people can contact to discuss the notice, and
- Any warnings regarding re-entry to the area, if specified on the pesticide product label or the APVMA permit.

The PUNP states it should be reviewed every 4-5 years, however it does not appear this has this occurred.

1.6.2 Chemically Sensitive Residents Register

Council maintains a register for Chemically Sensitive Residents and Organic Growers. The Register does not exclude Council from using herbicide within a given area in proximity to the registered person, but rather requires that Council notifies the registered person in advance of any works so they may vacate the property. On its website, Council advises residents that maintaining their road frontage will alleviate the need for spraying. To enable records to be kept up to date Council posts a renewal notice for the register in April of each year. The Register application form is attached at Appendix B.

Currently 97 residents are on the Register, which has been maintained since 2004; 37% of registered landholders are within rural zoned land, with the remaining 63% residing within urban areas. Of those registered, approximately 22% are organic growers, with the remaining 78% registered as being chemically sensitive.

1.7 Council guidelines and supporting information

Several guidelines and reports have been completed relating to weed management of in Byron Shire and have been considered in the preparation of this Strategy (refer Table 1.5). The Strategy incorporates elements of all these plans and will become the guiding document for weed control in the Shire, as shown at Figure 1.1.



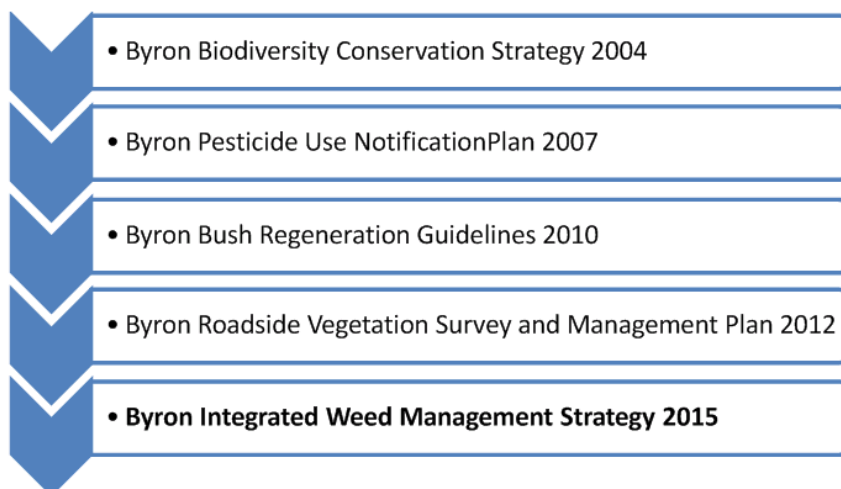


Figure 1.1 Contributing Council Strategies and Plans to the Integrated Weed Management Strategy

A summary of relevant Council plans and guidelines is shown at Table 1.5.

Table 1.5 Summary of Council guidelines and relevant documents

Document	Summary
Byron Shire Roadside Vegetation Survey (2012)	The Roadside Vegetation Survey included 860 km of roadside vegetation, with 25 different vegetation communities (including four endangered ecological communities [EECs]) and a number of rare and/or threatened species identified. Noxious and environmental weeds were determined to be a significant threat to the biodiversity of roadside verges.
Byron Roadside Vegetation Management Plan (2012)	<p>The <i>Byron Biodiversity Conservation Strategy</i> (2004) identified the preparation of a Roadside Vegetation Management Plan (RVMP) as a high priority. In 2012 Geolink were engaged by Council to produce the RVMP based on the roadside vegetation survey by EnviTE (refer above). The RVMP aims to:</p> <ul style="list-style-type: none"> • Protect significant conservation values, including threatened species and EECs, • Balance ecological conservation with the necessities of roadside vegetation management, • Outline the preferred management technique for roadside vegetation within the project area, and • Improve council's capacity to improve, protect restore and minimise damage to significant roadside vegetation by promoting improved management practices. <p>The RVMP identified significant conservation issues surrounding roadside vegetation and prescribed a number of weed management actions that guide Council staff in the field.</p>
Byron Shire Bush Regeneration Guidelines (2010)	The primary document that guides bush regeneration works in the Shire is the <i>Byron Shire Bush Regeneration Guidelines</i> (2010) (BSBRG). The BSBRG provides comprehensive background information on the characteristics of weeds in Byron Shire, describes best practice control techniques suitable and provides a framework for the preparation of a bush regeneration action plan to inform the community when considering weed control works.
Tweed Byron Bushland Audit (2010)	The <i>Tweed Byron Bushland Audit</i> (Bush Futures, 2010) aims to improve urban and peri-urban bushland sustainability in the Tweed and Byron Shires. The Audit assessed all bushland remnants within 2km of urban settlements with priority

Document	Summary
	<p>given to public lands adjoining urban areas, private lands adjoining urban areas and other sites of significance. Each site assigned a Management Intensity Class (MIC) based on assessment of site condition, weed composition and cover and other management requirements. The MIC describes the frequency of restoration work required to restore the site to a minimal maintenance level and how many years this would take to achieve. A cost per hectare of restoration work for each MIC was determined based on the visitation frequency for each, based on the current standard costing for a team of three bush regenerators in the Northern Rivers in 2010.</p> <p>This methodology identified ten classes of management intensity required for various scenarios and identified a range of costs. Costs ranged from \$1920/ha for low maintenance sites requiring one year's maintenance to \$108,480/ha for very high maintenance sites requiring six years maintenance.</p> <p>Key recommendations from the Audit included:</p> <ul style="list-style-type: none"> • Recognition and allocation of funds required by councils to invest in and restore urban bushland at prioritised sites, • Promotion of the value of urban bushland and a community education program to raise knowledge and awareness of this, and • Enhanced targeted community involvement programs to reduce threats to urban bushland.
<i>Site Specific Bush Regeneration Plans</i>	Council's Bush Regeneration Team undertakes works at a number of sites across the Shire where specific bush regeneration plans to guide works have been prepared. Plans typically comprises a map of the study site, a list of threatened species present at the site, a list of target weed species at the site, management issues, actions/recommendations, weed control techniques and monitoring requirements.
<i>Byron Shire Native Species Planting Guide</i>	The Byron Shire Native Species Planting Guide encourages local residents to select and plant appropriate native plant species.

1.8 How to use the Strategy

The Strategy is in three parts:

- **PART 1:** provides background information, definitions, a summary evaluation and details relevant planning matters.
- **PART 2:** takes a strategic approach to meeting Council Resolution 13-621 and provides a range of actions to meet project objectives.
- **PART 3:** provides an overview of Council practices and an assessment of alternative weed control methods. This information has guided the actions prescribed in Part 2.

1.9 Evaluation summary

Based on the evaluation completed in Part 3 of this report it was concluded that:

- Council meets its statutory requirements with regard to having a *Pesticide Use Notification Plan* and providing a registration option for chemically sensitive residents and organic growers.



- Council uses a range of weed management techniques in an integrated manner to maintain various land types within the Shire, including a range of high use public areas.
- Glyphosate and Metsulfuron-methyl (MM) are effective, low cost herbicides which (when used appropriately and in accordance with the PUNP) are likely to have relatively low impacts on the environment. Further, both products are suitable to manage a range of weeds from grasses and herbs to vines and woody weeds, and hence are suited to environmental works where a flexible approach to weed management is required.
- A range of selective herbicides are used for managing playing fields and parks, where glyphosate/MM are not suitable. These products are typically of higher toxicity. While the range of selective herbicides utilised by Council/contractors is part of the overall 'toolkit' for maintaining these facilities to a high standard, use of a Schedule 7 herbicide (MSMA) is of concern and alternative products should be used.
- Specialist management is required for A grade playing fields (e.g. Cavanbah, Jeff Schneider, Bangalow and Byron recreation fields) where selective herbicides are required to maintain playing surfaces and where no practical alternatives exist. On this basis, chemical based herbicides will continue to be used in these areas, but with a focus on minimising use, using lowest toxicity products and trialling any new and emerging products of low toxicity.
- Based on the review of alternative weed control techniques, steam weeding has potential for use in specific situations and its use should be adopted within high use public areas.

Several scenarios for future weed control in the Shire in consideration of Resolution 13-621 were then considered, with the adopted strategy being to:

Refine current methodologies to seek to address Resolution 13-621, including the adoption of new methods/technologies.

This 'middle ground' approach is considered the best means of addressing Resolution 13-621 and delivers good outcomes for the public, the environment and Council, and has informed the actions proposed in Section 2 of the Strategy.

Based on the review in Section 3 and following discussion with Council staff it is evident that elimination of chemical-based herbicide use in high use public areas cannot be achieved for the following reasons:

- Turf maintenance in A grade sportsfields cannot currently be achieved without the use of selective herbicides.
- Where unusual circumstances occur and weed control within a high use public area cannot be achieved under the strategy of reduced herbicide use above, there may be a need to use chemical based herbicides to maintain open space, utilities and assets to an expected standard.

While not meeting the end goal of Resolution 13-621, the actions prescribed in the Strategy nevertheless represent an aspiration to reduce the use of chemical-based herbicides and adopt best practice management to improve future outcomes in weed control.





Part 2

The Strategy



2 Management Framework

2.1 Introduction

Baseline information regarding current weed control methods utilised by Council has been reviewed and considered in Part 3 of the Strategy. Part 2 of the Strategy utilises this information to inform strategic actions to achieve Resolution 13-621. As noted in item 2(c) in the Resolution, the Strategy is to:

- Promote the concept of best practice weed management,
- Take an integrated approach to the control of weeds and vegetation, and
- Use methods with the least potential to adversely affect human health and the environment while achieving desired outcomes.

2.2 Aspirations and targets

Section 2.5 prescribes a range of actions based on the information and review process to date. However these actions must consider the input from stakeholders – including Council employees, relevant agencies and the public. As the aspirations of different stakeholders may vary considerably, finding a 'middle ground' is an important component of the Strategy so a balanced, practical and integrated outcome is achieved. An example of the competing interests of stakeholders is summarised at Figure 2.1.

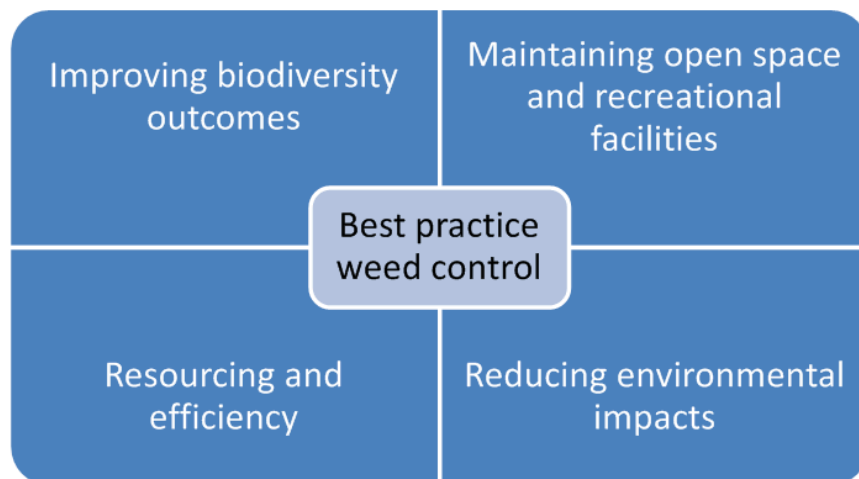


Figure 2.1 Relevant factors in achieving best practice in weed control

For those in the community opposed to herbicide use, input into development of transitional actions to reach the goal of Resolution 13-621 is vital. By considering various viewpoints and accommodating practical measures, it is the aim of the Strategy that prescribed strategic actions reflect the consultation process, have included relevant stakeholders and are supported by ratepayers (community) and Council, who are responsible for delivering the Strategy.

The Strategy also has application in the sense of providing an identity of the Byron Shire community with regard to adopting innovative practices; values which are enjoyed both by residents and tourists alike.

2.3 Strategy targets

Actions have been prescribed to address four Strategy Targets developed to implement Councils resolution:

1. Reduce chemical herbicide use in high use public areas within the next 5 years.
2. Seek to reduce chemical herbicide use in other areas where weed control occurs.
3. Seek to achieve best practice weed management through implementation of an integrated approach to weed control and vegetation management.
4. Improve community engagement and knowledge through proactive communication and transparency.

The objectives of the Strategy Targets are summarised at Table 2.1.

Note: Based on the review in Section 3 and following discussion with Council staff it is evident that elimination of chemical-based herbicide use in high use public areas cannot be achieved for the following reasons:

- Turf maintenance in A grade sportsfields cannot currently be achieved without the use of selective herbicides.
- Where unusual circumstances occur and weed control within a high use public area cannot be achieved under the strategy of reduced herbicide use above, there may be a need to use chemical based herbicides to maintain open space, utilities and assets to an expected standard.

While not meeting the end goal of Resolution 13-621, the actions prescribed in the Strategy nevertheless represent an aspiration to reduce the use of chemical-based herbicides and adopt best practice management to improve future outcomes in weed control.

Table 2.1 Strategy targets and objectives

Target	Objectives
1. Reduce chemical herbicide use in high use public areas within the next 5 years	Objective 1: Define high use public areas with the aid of GIS mapping.
	Objective 2: Trial alternative methods of chemical – free weed control in high use public areas.
	Objective 3: Review all weed management practices with regard to current best practice.
	Objective 4: Reduce and replace highly toxic Schedule 7 herbicides.
2. Seek to reduce chemical herbicide use in other areas where weed control occurs	Objective 1: Improve record keeping of herbicide use and integrate data across departments.
	Objective 2: Assess all weed control equipment owned by Council.
	Objective 3: Review pesticide notification protocols.
	Objective 4: Review weed management practices for infrastructure (roads and drains).
3. Seek to achieve best practice weed management through implementation of an integrated approach to weed control and vegetation management	Objective 1: Assess hygiene protocols for slashing.
	Objective 2: Review of plantings as a long-term management tool.
	Objective 3: Review roadside slashing practices.
	Objective 4: Review of alternative roadside verge treatments.
	Objective 5: Review alternative weed control applications.
4. Improve community engagement and knowledge through proactive communication and transparency	Objective 1: To improve communication between community and Council.
	Objective 2: To continually improve information delivery to the community regarding weed control methods.
	Objective 3: Engage with landcare and duncare groups.
	Objective 4: Engage with Southern Cross University to determine future research projects.
	Objective 5: Engage with relevant stakeholders to review the potential for the use of fire as a weed management tool.
	Objective 6: Engage with certified organic farmers within the Shire.

2.4 Identifying high use public areas

Areas of public open space are considered in the context of the main urban areas within the Shire including South Golden Beach, Billinudgel, Ocean Shores/New Brighton, Brunswick Heads, Mullumbimby, Byron Bay (including Sunrise Estate), Suffolk Park (including Bayshore Estate), Bangalow and Broken Head. Within each of these urban zones, public places have been ranked based on high, low and moderate usage. As a guide, the levels of public use noted in the *Pesticide Use Notification Plan* (2007) have been adopted and ranked accordingly (refer Table 2.2).

On this basis, key actions will focus on all high use areas of public space (i.e. those with a ranking of 1), with second tier actions (i.e. actions for overall improvement in weed management) adopted for moderate to low use areas ('other areas') of public space.

A map series delegating areas of high use open space within a 2km radius of the major urban areas is attached at Appendix C. The maps show areas of Council managed land, with high-use areas identified (i.e. parks and garden beds, playgrounds, picnic tables/shelters, urban infrastructure, sportsfields/ovals/golf course, swimming pools) where key actions prescribed in the Strategy will be targeted. Special consideration has been given to sportsfields where turf maintenance cannot be achieved without the use of selective herbicides; as such these areas are mapped as High Use (Controllable Active Space) to allow existing weed control methods to continue.



Note: this mapping is general only and further refinement within high use areas may be required where different landuses occur adjacent.

To refine high use mapping, development of an integrated GIS weed management system should aim to integrate information with other information such as roadside vegetation mapping, bush regeneration areas, and areas of public open space which may need special consideration.

Table 2.2 Ranking usage of public spaces (high use areas are shown in bold)

Public place	Level of use	Ranking
Buildings owned or managed by Council#	moderate to high	2
Caravan Parks	moderate, seasonally dependent	2
Cemeteries	moderate*	2
Coastal dunes, natural areas and bushland, natural wetlands and vegetated rivers and foreshores	low, other than adjacent to facilities, paths or trails.	3
Cricket wickets	high to low	2
Drains and drainage systems and constructed wetlands	low	3
Myocum Landfill (public areas only)	low to moderate	2
Parks and garden beds	high	1
Picnic tables and park shelters	high	1
Playgrounds	high	1
Rivers and foreshores (excluding natural areas and bushland)	low**	3
Road verges, road reserves, laneways and pathways	low in rural areas, moderate to high in urban areas	2
Sewage treatment plants and effluent reuse areas	low	3
Sporting fields and ovals, golf course	high	1
Swimming pools	high (seasonal)	1
Urban infrastructure (within CBD)	high	1
# weed control not relevant to actual buildings; weed control around such structures/facilities are captured within the 'urban infrastructure' category		
*cemeteries are also used indirectly for dog walking		
** may be high use in parks adjoining foreshore areas		

2.5 Actions

Actions nominated to meet target objectives are summarised at Table 2.3, with a rationale and output for each action nominated. Actions have been denoted where they may apply to high use areas (i.e. the focus of this Strategy) or other areas requiring general management. It is important to note that the Strategy is an adaptive document and as such, prescribed actions may be amended to improve outcomes or respond to any relevant findings during the implementation process.

In order to maintain achievable and measurable outcomes from the actions outlined in this strategy, prioritisation of actions is necessary to achieve Council's Resolution. Strategic actions have been divided into three categories:

High priority actions – actions that are important for the successful implementation of the



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Strategy which must be considered first in order to effectively address the requirements of Resolution 13-621. If high priority actions are not able to be implemented effectively, then the overall implementation of the Strategy is likely to experience major set-backs.

Medium priority actions – actions that require some planning and associated costs. Timing of medium priority actions are important for successful implementation of the Strategy, although actions can be staged over a longer timeframe when compared with high priority actions.

Low priority actions - actions that are relatively easy to implement and do not require substantial planning or cost. Low level actions generally do not have an associated timeframe by which they must be completed. Although low priority actions should be considered after medium and high priority, they are important for the successful implementation of the Strategy.

Performance indicators and implementation of prescribed actions are further discussed at Section 2.6.

It is anticipated that actions prescribed in the Strategy will commence by July 2016, with a preliminary review completed within a two year period (as per Resolution 13-621, item 3c).

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Table 2.3 Summary of actions

	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
1.	Refine mapping of high use public areas, integrate with other relevant data and incorporate into Councils GIS system	<ul style="list-style-type: none"> - Address Resolution 13-621 - Defining High use public areas - Improve mapping and data 	<ul style="list-style-type: none"> - Mapping available to staff which identifies areas where herbicide restrictions apply 		High	✓	OSRR
2.	Develop scientific based methods and use to trial and evaluate alternative methods of weed treatment as they become available. Trial should evaluate effectiveness and cost and provide information on the trial results should be available to the public.	<ul style="list-style-type: none"> - To inform effectiveness and suitability of alternative methods - To build on previous chemical-free weed control trials - To keep the public informed and engaged with alternative methods of weed control 	<ul style="list-style-type: none"> - Implementation of trial for steam weeding (funding secured). Results from trial to guide further usage (now completed – BSC now own and operate a steam machine) - Implementation of pilot trial for other alternative methods identified (funding required). Results from trial to guide further usage 		High	✓	OSSR, NE
3.	Establish a staff working group to co-ordinate and evaluate weed management programs. Working group should meet a minimum of 2 times per year and include a staff representative from each management area of Council involved in weed management as well as Far North Coast Weeds.	<ul style="list-style-type: none"> - To improve methods and practices - To integrate communication and practices across departments - To provide opportunities to discuss and share information relating to weed management 	<ul style="list-style-type: none"> - Working group established following adoption of this Strategy 		High	✓	OSSR, NE WORKS



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
4.	Arrange community workshops (including practitioners ,TAFE staff, SCU representatives, NPWS, FNC Weeds, Landcare groups and organic farmers) to discuss best practice weed management and share knowledge with the community.	<ul style="list-style-type: none"> - To inform the community - To share/disseminate information 	<ul style="list-style-type: none"> - One community workshop per year organised for the life of the Strategy 		Medium		OSSR, NE
5.	Establish, document and adopt cultural practices that reduce opportunities for weed establishment and growth, including machine hygiene, nutrient management, mulching, green waste handling, soil management, compliance reporting and monitoring.	<ul style="list-style-type: none"> - To implement weed prevention based horticultural management practices 	<ul style="list-style-type: none"> - Improved integration weed management approach - Reduce opportunities for establishment and infestation 		Medium	✓	OSRR
6.	Collaboration with Landcare and Dunecare groups to identify opportunities for community involvement in weed control, including high conservation value areas.	<ul style="list-style-type: none"> - To engage with the community and enable participation in weed control - To connect interested members of the community and share information 	<ul style="list-style-type: none"> - Increased volunteer involvement in weed management. 		Medium	✓	OSRR



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
7.	Review use of MSMA in comparison with lower toxicity selective herbicides and investigate use of alternative products.	<ul style="list-style-type: none"> - To reduce use of high toxicity herbicides - To refine and adapt existing methods to reduce herbicide use. 	<ul style="list-style-type: none"> - Review and use alternative low toxicity herbicide where possible 		High	✓	OSRR
8.	Engage with sporting clubs to provide information, training, support and equipment for manual removal of tussock grasses (e.g. Crowsfoot Grass) on sports fields.	<ul style="list-style-type: none"> - To engage with sportsfield users and establish lines of communication - To enable sporting clubs to control weeds and have a degree of autonomy in this regard - To reduce use of selective herbicides on sportsfields in Byron Shire 	<ul style="list-style-type: none"> - Formal engagement with all clubs - Increased manual control and decreased selective herbicide use 		High	✓	OSRR



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
9.	<p>Use a standard pro-forma to ensure consistent recording of herbicide usage across all Council departments, ensuring all information required under the <i>Pesticide Regulation</i> is recorded.</p> <p>Continue to input data into the central database to allow for ongoing monitoring and review of herbicide usage.</p>	<ul style="list-style-type: none"> - To ensure statutory obligations are being met - To track herbicide use and record usage rates - To provide data which enables comprehensive review 	<ul style="list-style-type: none"> - Standardised record keeping - herbicide database allowing with annual reporting and comparison - Staff training and support - Liaison with contractors 		High	✓	OSRR
10.	<p>Complete maintenance audits on weed control equipment owned/maintained by Council. Audit to be completed internally, with the measure of success that all equipment has been serviced to ensure safe and efficient use.</p>	<ul style="list-style-type: none"> - To ensure all weed management equipment is appropriately and maintained - To ensure operator safety 	<ul style="list-style-type: none"> - Bi-annual (6 monthly) audits and reporting - Staff training and support 		High		OSRR, WORKS
11.	<p>Based on Action 10, replace any worn or inefficient equipment so as to maintain optimum performance. Identify any need for purchase of new or alternative equipment to increase efficiencies.</p>	<ul style="list-style-type: none"> - To ensure operator safety - To update equipment where new efficiencies may be gained 	<ul style="list-style-type: none"> - Comprehensive equipment inspection and repair and establishment of annual register - Staff training and support 		High		OSSR, WORKS



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
12.	Review and update <i>Pesticide use Notification Plan</i> * to incorporate recommendations in this Strategy *including Chemically Sensitive Residents Register	<ul style="list-style-type: none"> - To ensure herbicide notification addresses community expectations - To ensure the PUNP is in alignment with the Strategy 	<ul style="list-style-type: none"> - Clarification of notification requirements for those on the chemical sensitive register - Inclusion of recommendations regarding public exclusion for areas where herbicide usage has occurred. 		High	✓	OSSR, WORKS, NE
13.	Review current weed control methods for infrastructure, roads and drains in order to assess affectivity and efficiency of weed control works on roadsides and drainage lines.	<ul style="list-style-type: none"> - To improve efficiency of management measures, improve asset delivery and longevity - Ensure compliance with other stakeholders (e.g. Roads & Maritime Services) 	<ul style="list-style-type: none"> - Adaptive management that improves efficiency of weed management practices for infrastructure 		Medium		WORKS, NE
14.	Develop and trail a road drain design that: <ul style="list-style-type: none"> - reduces opportunity for weed growth - enables appropriate conveyance without road scour. - Incorporates the planting of suitable native species where possible 	<ul style="list-style-type: none"> - Improve efficiencies in weed control and asset management 	<ul style="list-style-type: none"> - Review (and amendment) of existing design - Trail alternative drain design 		Medium		WORKS



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
15.	Investigate options and implement measures to improve machine hygiene with regard to the <i>Roadside Vegetation Management Plan</i> .	<ul style="list-style-type: none"> - To reduce the spread of weeds through poor machine hygiene - To ensure all staff are aware of and familiar with protocols so they can be implemented as standard procedures 	<ul style="list-style-type: none"> - Establish clear achievable hygiene protocols - Develop machine hygiene check list sheet for tractor slashers and ride-on mowers operated by Councils staff and contractors 		Medium		OSSR, WORKS
16.	Develop a calendar of flowering/seeding time for weed plants.	<ul style="list-style-type: none"> - to inform a management approach which works more effectively through consideration of weed plant life cycles - To increase knowledge and improve management of specific species (e.g. Ragweed, Crowsfoot Grass) 	<ul style="list-style-type: none"> - Calendar established/refined and made available to public 		Medium		NE
17.	Review the timing/regime of roadside and open space slashing and adjust to be more effective with regard to targeting noxious or specific problematic weeds prior to flowering (based on the flowering/seeding calendar developed for Action 18).	<ul style="list-style-type: none"> - To improve potential to manage species seeding/flowering 	<ul style="list-style-type: none"> - Review and adapt slashing program - Staff training and support 		Low		OSRR, WORKS



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
18.	Complete strategic review of opportunities for native tree plantings to replace weed dominated and cleared land throughout public areas in the Shire.	<ul style="list-style-type: none"> - Implementation of long term weed management - Improve biodiversity and aesthetic values - To demonstrate ongoing commitment to vegetation management and improving biodiversity values 	<ul style="list-style-type: none"> - Survey of public areas and preparation of strategic works plan - Seek funding opportunities 		Low		NE
19.	Trial ground cover and grass plantings as a means to specifically limit weeds on roadside verges and around road markers (e.g. mat-rush or other native groundcovers).	<ul style="list-style-type: none"> - To reduce weed control requirements in the long term - To adopt alternative management methods 	<ul style="list-style-type: none"> - Trial planting completed and costed over minimum 2 year period 		Low		OSRR, WORKS
20.	Ensure roadside weed control in high quality roadside vegetation and other sensitive areas includes input from bush regenerators and includes integrated vegetation management methods (e.g. hand weeding/manual removal, targeted/selective weeding, planting).	<ul style="list-style-type: none"> - To ensure high quality roadside vegetation is not adversely affected by weed control works - To manage weeds using a variety of methods appropriate to sites and species 	<ul style="list-style-type: none"> - Internal communication and discussion with contractors 		Medium		OSRR, WORKS
21.	Ensure consideration is given to retention of vegetation which minimises management requirements and hence reduces herbicide use (e.g. restrict spraying of Red Natal and Molasses Grass on steep batters).	<ul style="list-style-type: none"> - To improve efficiencies in management of roadside verges - Recognition that some weed species perform a useful role with low environmental impacts 	<ul style="list-style-type: none"> - Identification of key areas where herbicide spraying should be excluded and ensure communication as part of training for staff/contractors 		Medium		WORKS, OSRR



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
22.	Examine potential for appointment of a Council extension officer regarding the IWMS and other matters related to biodiversity management.	<ul style="list-style-type: none"> - To engage with community - To provide guidance, resources and support 	<ul style="list-style-type: none"> - Appointment of extension officer 		Medium	✓	NE
23.	Provide regular updated information on weed control (including proven chemical free methods) via Councils website, rates notices, Council offices, advertising, group email lists.	<ul style="list-style-type: none"> - Community support and information sharing - Improving knowledge base 	<ul style="list-style-type: none"> - Establishing communications protocol for delivery of this information - Staff appointed to prepare information leaflets on a quarterly basis - 		High	✓	NE
24.	Revise existing Council weed profiles: <ul style="list-style-type: none"> - to update control information - identify common weeds without a profile - consider way of distributing information, including relocating on Councils website 	<ul style="list-style-type: none"> - Community support and information sharing - Improving knowledge base 	<ul style="list-style-type: none"> - Weed profiles reviewed and updated by second year of Strategy 		Medium		NE
25.	Encourage and support rural landholders to undertake management of weeds and vegetation on adjoining Council owned and/ or managed land.	<ul style="list-style-type: none"> - Community support and information sharing - Increased weed management 	<ul style="list-style-type: none"> - Engagement with rural landholders - Information provided as per Action 26 		Medium		NE, OSRR, WORKS



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
26.	Engage with Landcare and Dunecare groups to identify ways of supporting the work of volunteers working on Council management land on an ongoing annual basis.	- Community support and information sharing	<ul style="list-style-type: none"> - Improved community education and connection to country - Improved technical support (knowledge and financial) and training assistance for landcare groups - Appointment of extension officer 		Medium		OSRR, NE
27.	Collaborate and support FNCW and LLS with respect to biological control applications.	To improve adaptive weed management	<ul style="list-style-type: none"> - Engagement with Far North Coast Weeds - Biological control options considered and used where appropriate 		Low		OSRR, NE
28.	Develop a list of potential research projects relating to weed management in Byron Shire and engage with SCU to promote to undergraduate or post-graduate students	To improve knowledge and strengthen relationships	<ul style="list-style-type: none"> - Liaison with SCU. - Increase in research projects relating to weed biology and management 		Low		NE
29.	Engage with key stakeholders (NR Fire and Biodiversity Consortium, OEH, Nature Conservation Council, Universities, private practitioners) to review the role of fire in weed management (including road reserves).	<ul style="list-style-type: none"> - To improve knowledge and methodologies - To inform opportunities for use of fire in weed management - To reduce herbicide usage 	<ul style="list-style-type: none"> - Liaison and engagement - Increase understanding in weeds response to fire 		Low		NE



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
30.	If Action 30 indicates there are opportunities for using fire as a management tool, a Fire Management Strategy should be prepared.	- Adoption of new management methods	- Liaison/engagement with key stakeholders; preparation of Fire Management Strategy if deemed a suitable management tool.		Low		NE
31.	Preference given to use of equipment to minimise herbicide spray drift (e.g. shrouded booms).	- Use of available technology to reduce herbicide drift - To reduce off target impacts	- Use of available specialized equipment - Reduce risk of off target impacts		High	✓	OSRR
32.	Purchase steam generating equipment	- Adoption of new management methods - To reduce herbicide usage	- Purchase of new equipment - Incorporate use of steam to control weeds where suitable - Use of steam for other purposes such as asset, plant and equipment hygiene activities		High	✓	OSRR
33.	Review management of retention cells at Sewage Treatment Plants and investigate options for improved management to reduce aquatic weed establishment, growth and spread	- To inform improved management options - Reduce weed management requirements	- Review undertaken - Trial and implement suitable cell management techniques		Medium		W&W
34.	Liaise with other Councils trialing alternative weed control methods;	- To improve knowledge and strengthen relationships	- Liaison and engagement		Medium		OSRR, WORKS, NE



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
35.	Undertake ongoing evaluation of bush regeneration techniques to ensure Council uses best practice methods as identified by peak industry groups such as Australian Association of Bush Regenerators (AABR) and Society for Ecological Restoration (SERA).	<ul style="list-style-type: none"> - To ensure staff remain informed and up to date with weed management - To align Council practices with current 'best practice' 	<ul style="list-style-type: none"> - Staff training 		High		NE
36.	Examine and refine spraying protocols for working near water.	<ul style="list-style-type: none"> - Adoption of best practice methods - To reduce herbicide usage - To minimise environmental impacts 	<ul style="list-style-type: none"> - Staff training 		High		NE, OSRR, W&W
37.	Promote the use of Green Waste bins to reduce dumping of garden waste into areas of public land.	<ul style="list-style-type: none"> - To inform and educate the public 	<ul style="list-style-type: none"> - Community communication 		High		OSRR
38.	Undertake broad scale weed mapping of the most serious environmental weeds as part of co-ordinate management programs. This could include the development of community surveys to promote citizen science in weed management.	<ul style="list-style-type: none"> - To improve knowledge and strengthen relationships 	<ul style="list-style-type: none"> - Targeted weed mapping 		Low	✓	NE



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	Action/s	Rationale	Outcome	Resourcing	Priority	High use areas	Responsibility
39.	Undertake staff/ contractor training in the application of this Strategy including: - Weed identification - Weed management techniques - Herbicide use	- To improve staff engagement and knowledge	- Annual staff training undertaken for life of Strategy		High	✓	OSRR, W&W, WORKS
40.	Complete induction training for contractors with regard to recommended actions in the Strategy	- To clarify the actions and aims of the Strategy and contractor obligations	- Contractor liaison		High	✓	OSRR, W&W, WORKS
41.	Liaise with the APVMA regarding amendments to registration and/or advice relating to glyphosate.	- Be aware and informed of new information	- Liaison by staff		High		OSRR
42.	Work with local nurseries to promote the sale of non-invasive and native plants and discourage the sale of current or potential environmental weeds.	- To reduce future weed risks and promote good practice	- Engagement with nurseries - Promotion through community information and workshops		Low		NE, OSRR
43.	Provide market organisers with undesirable species lists and carry out inspections of market stalls selling plants.	- To prevent the spread of weeds within the Shire and promote weed wise education to the public.	- Engagement with market organisers. - Engagement with public.		Low		NE, OSRR



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2.6 IWMS Key Performance Indicators (KPI's)

To ensure actions are consistent with a SMART approach (i.e. Specific, Measurable, Attainable, Relevant, Time-bound); key performance indicators (KPIs) are necessary to examine their efficacy over time. KPIs should be developed for each strategic action in order to determine whether targets were reached during the first revision of the IWMS following its implementation. A set of simple questions were developed to guide the revision process to determine KPIs.

- 1) Were the actions of the IWMS implemented? Yes > ... No > ...
- 2) What were the results of the implemented actions and have they achieved the target?
- 3) If target was not reached, why was it not reached?
- 4) Is there further scope to implement actions to reach target?
- 5) If target was reached, what are the recommendations based on the outcomes of implemented actions?

A review of KPIs for each action should be completed annually to determine whether actions are being met and that the Strategy is being 'rolled out' in an appropriate manner.

2.7 IWMS implementation and review

It is anticipated that the actions prescribed in the Strategy will commence by July 2016, with a preliminary review completed within a two year period (as per Resolution 13-621, item 3c). The review process would result in a report back to the Steering Committee for discussion and further resolution.



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Part 3

Weed Management Review & Supporting Information



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3 Weed Management

3.1 Biodiversity and weeds in Byron Shire

Byron Shire covers an area of approximately 566.7 km² and encompasses a high level of biodiversity at the ecosystem, species and genetic level, being one of the most flora and fauna rich areas in Australia (Byron Biodiversity Conservation Strategy [BBCS], 2004). This is reflected by a diversity of terrestrial ecosystem types including rainforest, wet and dry sclerophyll forest, grasslands, paperbark swamps, wetlands, mangroves, saltmarsh, heath and freshwater ecosystems. The Shire also supports a large number of threatened flora and fauna species and endangered ecological communities (EECs).

The biodiversity of Byron Shire can be attributed to a number of environmental factors including its geological diversity, varied topography and climate, which offers relatively high seasonal rainfall. Current and past land use practices have also had a major influence on biodiversity in the Shire, which has seen large-scale land clearing and habitat modifications over the past 160 years (Parkes *et al.*, 2012). Land clearing and habitat modification has ultimately reduced biodiversity values and created a number of further threats (see BBCS, 2004), one of which is the introduction of exotic invasive plants. As soil fertility and high rainfall influence biodiversity, these environmental conditions are also influential over exotic plant distribution following disturbance (Zavaleta *et al.*, 2001).

Council are responsible for the management of weeds over large areas of public land for a range of purposes including infrastructure management and protection of the environment. The current management approach involves a range of techniques including both the use of chemical herbicides as well as other practices including slashing, planting and mulching. It is a statutory obligation that Council controls noxious and environmental weeds listed in the schedules of the *Noxious Weeds Act 1993*.

3.2 What is a weed?

A weed is an introduced plant that occupies an area undesirable for that plant and requires some form of action to reduce its impact on the natural environment, the economy, human health and public amenity (Oakwood, 2009). While the majority of weeds are introduced species, they may also include native species occurring outside their natural range, e.g. Umbrella Tree (*Schefflera actinophylla*) and Coast Tea-tree (*Leptospermum laevigatum*).

Baker (1964) first described the typical biological features of plants likely to become weeds, which included: the ability to reproduce sexually and asexually, rapid growth from seedling to sexual maturity, adaptation to environmental stresses and a high tolerance to environmental heterogeneity (i.e. can occupy a range of areas with varied environmental conditions). For an overview of weed biology see 'The Population Biology of Invasive Species' (Sakai *et al.*, 2001).

In NSW weeds are classified in five broad categories based on their characteristics and impacts including:



- **Noxious weeds** – Weeds with potential to spread and considered to pose a threat to individuals and the community. Noxious weeds are legally required to be controlled by landholders. There are five classes of noxious weeds identified in the *Noxious Weed Act 1993* (refer Section 1.5) including:
 - 1) State Prohibited Weeds
 - 2) Regionally Prohibited Weeds
 - 3) Regionally Controlled Weeds
 - 4) Locally Controlled Weeds
 - 5) Restricted Plants
- **Environmental weeds** – Plants which pose a threat to natural ecosystems. These plants have the capacity to invade and establish themselves within plant communities and compete with native species for resources and ultimately reduce biodiversity through this process. Environmental weeds may also impact on human health, access, recreation activities, physical infrastructure and aesthetic values.
- **Agricultural weeds** – Plants which present a threat to agricultural production. These plants may interfere with agricultural practices, affect the quality of produce and may be harmful to livestock.
- **Weeds of National Significance (WoNS)** – The *Australian National Weeds Strategy* (2007) identified 20 introduced plant species as being of national significance. These plants are regarded as being the worst weeds species in Australia based on their invasiveness, potential to spread, and economic impacts and environmental impacts. Each species is appointed a national coordinator to oversee the management and control of these weeds.
- **National Environmental Alert List weeds** – twenty eight species of environmental weed are identified as National Environmental Alert Weeds. These species are recognised as posing a significant threat to biodiversity if not managed.

While up to 28,000 plants have been introduced into Australia over the past century, approximately 10% of all introduced plants (2,700 species) are now considered as weeds (Williamson & Fittler, 1996) with over 370 species declared as noxious (Sinden *et al.*, 2004), with approximately 340 plants declared noxious weeds in NSW. Approximately 206 environmental weeds are known to occur in Byron Shire, with potential for a further 80 weed species to occur (refer Appendix D).

Councils weed database has been reviewed for the Strategy and noxious species and species within the categories of 'serious' and 'of concern' have been reviewed with regard to their form, biology and treatment methods (refer Appendix E). This information assists in weed management and should be updated as required and made publicly available for residents.

Of all known weeds within Byron Shire, 26 species are declared noxious under the schedules of the *Noxious Weeds Act 1993*. Plates 3.1 and 3.2 illustrate some common weeds within the Shire.





Plate 3.1 (a) A typical stand of Camphor Laurel (*Cinnamomum camphora*). Many road side verges, rainforest remnants and agricultural areas in Byron Shire are occupied by stands of Camphor Laurel, regarded as both an environmental and agricultural weed and listed as a class 4 noxious weed under the *Noxious Weeds Act, 1993* [Image: NSW Department of Primary Industries (NSW DPI)].

(b) Giant Devils Fig (*Solanum chrysotrichum*) is listed as a category 3 weed under the *Noxious Weeds Act, 1993*



Plate 3.2 (a): Lantana (*Lantana camara*) is an environmental weed that occurs through most states in Australia. Due to its wide spread proliferation and its impacts on the environment and the economy it is listed as Weed of National Significance (WoNS) under the *Noxious Weeds Act, 1993* [Image: EMR Project summaries].

(b) Coastal Morning Glory (*Ipomoea cairica*) has the potential to completely smother native plants and trees in coastal areas. It is classified as an environmental weed in Byron Shire under the *Noxious Weeds Act, 1993*

3.3 Why control weeds?

The introduction and invasion of introduced plant species has been recognised by government bodies and scientists as one of the greatest threats to biodiversity across the world (IUCN, 2000; Millennium Ecosystem Assessment, 2005) with Australia being no exception to the negative consequences of weed invasion (BBCS, 2004; Australian Weed Strategy (AWS), 2006). Introduced plant species also constitute a significant economic burden throughout Australia (Sinden & Griffith, 2007) and the world (Gallagher & Leishman, 2014) and may pose significant threats to human health and amenity (AWS, 2006). The following sections give a brief overview of the impacts of weeds in Australia.

3.3.1 Environment

Over the past three decades there has been a growing body of literature in Australia regarding the



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impacts of non-native plant species on the environment at the species, community and ecosystem levels (Lonsdale & Lane, 1994; Adair *et al.*, 1995; William & West, 2000; Batianoff & Butler, 2001; Sinden & Griffith, 2007; Van Klinken *et al.*, 2014; Day *et al.*, 2014; Gallagher & Leishman, 2014). Most scientists concur that invasive plant species pose a significant threat to a range of ecosystem services that our natural environments provide, including soil and water conservation and protection of biodiversity (Sinden & Griffith, 2006). With regard to impacts on biodiversity alone, Coutts-Smith & Downey (2006) found that the five weeds that posed the greatest threats to multiple threatened species across NSW were Lantana, Bitou Bush, Blackberry, Kikuyu and Scotch Broom.

Bitou Bush is an example of a highly invasive environmental weed that poses significant threat to coastal ecosystems and biodiversity in NSW, particularly along the North Coast (DEC, 2006) where it poses a direct threat to 55 threatened plant species, three endangered plant populations and 15 endangered ecological communities (DEC, 2006). As such, Bitou Bush has been listed as a key threatening process (KTP) under the *Threatened Species Conservation Act 1995* (TSC Act) and a Threat Abatement Plan (DEC, 2006) prepared in response.

Council (and other stakeholders) have recently been awarded funding for Bitou Bush control within the Shire as part of the *National Northern Containment Zone* (NNCZ) initiative, where one of the key aims is to reduce Bitou Bush densities across 377 hectares of land across four tenures within Byron Shire. Bitou Bush has already been significantly controlled within coastal parts of the Shire and similar control has also been completed within the Tweed Shire.

3.3.2 Economy

More than \$50 million of public money (about half from state government), supplemented by a large voluntary expenditure and effort is currently spent on weed control in NSW. In an attempt to quantify the economic losses associated with introduced plant species, Sinden *et al.* (2004) estimated the impacts on agricultural land, national parks, indigenous land and other public land to be in the vicinity of \$AUD 4 billion in loss of productivity and the direct costs associated with control and management, bio-controls, strategic planning and preventative measures. At a local scale weed control impacts on agricultural productivity and requires substantial financial inputs from private landholders, community groups, government agencies and Council.

3.3.3 Human health and amenity

Many weeds affect human health, causing allergies, dermatitis, asthma and other respiratory problems, particularly in children (AWS, 2007). Aquatic weeds also pose a threat to human health by reducing the quality of drinking water in supply dams and drinking water catchments. These weeds may also reduce the recreational qualities of areas affected which limit their usage. Some weeds also form impenetrable thickets, for example Lantana (*Lantana camara*) may hamper cultural activities and limit pedestrian and vehicle access. Weeds such as Bindii (*Soliva spp.*) can also impact on our ability to use areas of parkland/grassland, while species such as Annual Ragweed (*Ambrosia artemisiifolia*) may cause allergies. Invasive weeds may also decrease the aesthetic values of the landscape and compromise scenic amenity on a micro and macro scale.

3.4 Impact of weeds in Byron Shire

Weeds have a number of impacts on the Shire, particularly on biodiversity and agriculture, where they most commonly occur. As the Shire occurs in a subtropical climate with high rainfall and fertile soils, weeds may establish and spread rapidly. This is an important factor when considering control methods. For example some weed control methods used in city environments may be



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appropriate in that location/scenario, but would be inappropriate in the Shire.

The *Byron Roadside Vegetation Management Plan (RVMP)* (Geolink, 2012) found the three most common weeds along roadsides within the Shire were Broad-leaved Paspalum (*P. mandiocanum*), Camphor Laurel (*Cinnamomum camphora*) and Lantana. The RVMP also identified other common weeds as including Coral Tree (*Erythrina x sykesii*), a variety of vines and scramblers and a number of exotic grasses within roadside areas. This same suite of weeds is typical of areas of disturbed and consolidated vegetation where woody weeds are common and can form dense stands.

In contrast, woody weeds are typically infrequent in high-use public land such as playgrounds, parks and playing fields. However herbaceous weeds and grasses create impacts in terms of aesthetics, reducing the quality of turfed surfaces and reducing opportunities for use.

Table 3.1 summarises the impacts of weeds within the Shire.

Table 3.1 Impacts of weeds within Byron Shire

Area of impact	Comments
Biodiversity	As an area extremely rich in biodiversity, weed invasion poses risks to both established and regenerating vegetation and may directly and indirectly threaten a number of flora and fauna species. Weed invasion lowers the resilience of natural vegetation and may diminish floristic diversity by dominating exposed edges and disturbed areas.
Agriculture	Weeds are a given in agricultural landscapes, and weed control is part of integrated pest management in most agricultural sectors. Weed control impacts may vary substantially across different agricultural scenarios; from invasive grasses and herbs which reduce grazing productivity, to woody weeds (Lantana, Giant Devils Thorn, Camphor Laurel) invading pastures and plantations.
Economic	Costs associated with weed removal are substantial and affect a variety of stakeholders including private landholders, Council, Far North Coast Weeds, National Parks and Wildlife Services, and community/landcare groups. As an example, Councils annual budget for weed control (bush regeneration) under the Sustainable Environment and Economy department is \$150, 000 (three persons/4 days per week). These works are also supplemented by occasional grant projects which are contracted out. There is also substantial budget allocated to Infrastructure Services department, responsible for the maintenance of open space and utility areas.
Human health and amenity	Weed invasion can reduce amenity, a particularly important asset within a shire where tourism is significant. For the community, other impacts may be felt by impacts on health (e.g. allergies) or a reduction in land use – uncontrolled weed invasion may render walking trails and areas of open space unusable over time, while Bindii, if left untreated, can render parklands and playgrounds unusable for children. Annual Ragweed is a common weed of pastures, open woodlands, roadsides and disturbed areas. Ragweed produces large amounts of wind-dispersed pollen during late summer to early autumn which may cause severe allergic reactions in sensitive people, compounding health problems such as hay fever and asthma and causing skin irritations.

4 Weed Management on Council Land

4.1 Introduction

Council manages approximately 3450 ha of land within the Shire. Weed management ranges from works in high conservation areas to maintain biodiversity values, to maintenance of parks, gardens, infrastructure, roadsides and recreational areas for public and operational use. Council managed land comprises four categories (as defined in Part 2 of the *Local Government Act 1993*), described below and graphically depicted by area at Figure 4.1:

Community Land – Community land has a range of uses, and generally includes dedicated lands for use by community groups (e.g. memorial halls, citizen clubs, pre-schools, community halls and community centres). Community land may also exist as vacant land without any facilities. Community land accounts for 11.5% of all land managed by Council.

Operational Land – Operational land is used to facilitate and is not designated for public access (e.g. Sewerage Treatment Plants, Tyagarah Airfield, Councils works depot). Operational land accounts for approximately 10.7% of all Council managed land.

Crown Council (Council Managed Crown Land) – Council manage a number of crown lands/reserves such as recreational reserves, bush reserves and sporting fields, comprising 6.2% of Council managed lands.

Road Reserves – Road reserves account for the largest area managed by Council (71.5%), with approximately 2473 Ha of land managed along 860 km of roads throughout the shire (BRVMP, 2012).

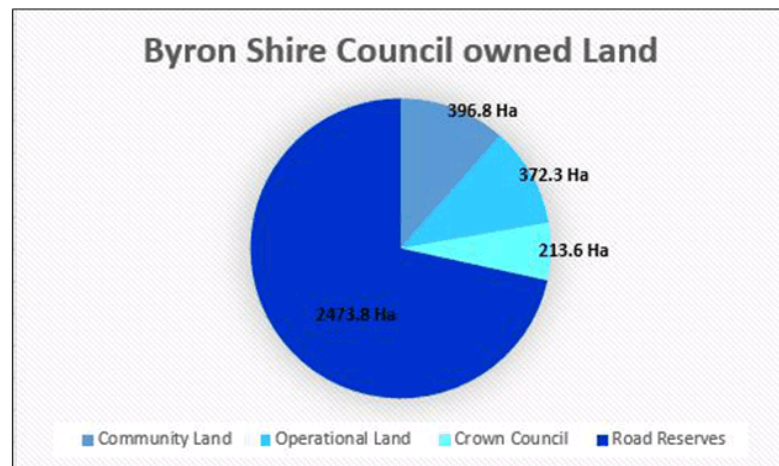


Figure 4.1 Weed management within various land uses in Byron LGA (2014 period)

Weed control works on Council managed land are nearly entirely carried out by Council (and/or its contractors) with two exceptions:

1. Weeds listed as noxious in the *Noxious Weeds Act 1993* within road reserves are subject to periodic control by Far North Coast Weeds (as the LCA for the region), and
2. Community environmental groups registered with Council complete voluntary weed control/bush regeneration activities at a number of sites throughout the Shire. Numerous volunteer groups occur, with the majority focussed on dune restoration, although other groups focus works on specific weed issues in other parts of the Shire. The role of volunteer groups is further discussed at Section 3.1.4.

As a key action of the *Byron Biodiversity Conservation Strategy* (2004), Council is committed to weed management to improve biodiversity values. To achieve this, Council maintains a bush regeneration team which works on Council managed crown land, urban areas, rural areas and roadside environments with High Conservation Value (HCV) areas taking precedence for bush regeneration works. Council's weed management and bush regeneration efforts are in alignment with a number of strategic plans and guidelines including the *Byron Shire Bush Regeneration Guidelines* (2010) and the *Byron Roadside Vegetation Management Plan* (2012).

Council is committed to weed management in urban areas where works are required to maintain aesthetics and amenity in public parks, playgrounds), recreational areas and urban roadsides. Council is also obliged to manage noxious weeds as required under the *Noxious Weeds Act*.

Note: within Byron Shire substantial weed control is completed by two other organisations:

- Office of Environment & Heritage (OEH) – administered through the National Parks and Wildlife Service (NPWS): weed control is completed on NPWS estate only (i.e. National Parks and Nature Reserves). A prominent (and visible) component of works is the control of Bitou Bush in dunal areas. This may include methods such as aerial spraying by helicopter.
- Far North Coast Weeds (FNCW): as the designated LCA, FNCW controls noxious and emerging weeds where they occur on public land. On this basis FNCW completes periodic weed control within road reserves within the Shire when required. Herbicide and surfactant use completed by FNCW in the Byron Shire for the 2013-2014 financial year is shown at Table 4.1.

Table 4.1 Herbicide and surfactant use in Byron Shire by FNCW (2013-2014 financial year)

Product	Amount used (litres)	Usage
Glyphosate	17	Grasses and herbs, some woody weeds
Unimaz	3	Alligator Weed
Grazon Extra	2	Woody weeds
Pulse	1	With Glyphosate
Metsulfuron	0	Not used

The actions within this Strategy do not apply to either OEH or FNCW (or other private practitioners) and are only for implementation by Council staff or appointed contractors.



4.2 Internal Management

Weed control is currently completed within two branches of Council:

- Infrastructure Services, and
- Sustainable Environment and Economy.

Infrastructure Services (IS) administers open spaces including parks, cemeteries and amenities, and is run by a Works Manager and Open Spaces Manager answering to the Director. Sustainable Environment and Economy (SEE) administers weed control through the Koala Connections Program and Councils bush regenerators. These programs are directed by the Team Leader for the Natural Environment, answering to the Manager for Land and Natural Environment who answers to the Director.

Note: Council is currently restructuring, so internal management is subject to change. As part of the restructure, the bush regenerators currently employed in Sustainable Environment and Economy will transfer to Infrastructure Services, therefore all staff actively controlling weeds in the field will be working out of the one Council division. The exception to this will be works undertaken through Koala Connections (using contractors) and other similar projects will remain under SEE. Essentially, the SEE Directorate generally will develop relevant plans and strategies and Infrastructure Services will undertake on-ground works.

4.3 Herbicides used by Council

Council has two separate divisions which control weeds:

- The bush regeneration team - manages bushland and reserves targeting environmental weeds,
- The parks division – primarily manage weeds within urban areas (parks, gardens and recreational areas), but also includes roadsides.

Table 4.2 summarises herbicides, adjuvants and surfactants used by Council and where they are used; summary profiles are attached at Appendix F.

Using any herbicide, adjuvant and surfactant carries the risk of human and environmental harm. Council operators and contractors wear Personal Protective Equipment (PPE) to minimise contact with chemicals, while use of signage, advertising, notices on Councils website (etc.) are used to minimise the potential for the public to encounter herbicide during the application process.

Risks to the environment are minimised by the adoption of best-practice methods which include:

- Spraying in suitable conditions (low wind, low likelihood of rainfall),
- Minimising herbicide use close to waterways,
- Using 'frog friendly' forms of glyphosate near waterways, and
- Utilising appropriate weed treatment methods to minimise potential for 'off site' herbicide contact.



All Council staff administering herbicide are required to keep a log of chemicals used, where they are used and the area treated in accordance with the requirements of the *Pesticides Regulation 2009*. This also forms part of Councils policy that members of the community are notified of the application of herbicides as per the PUNP.

Table 4.2 Herbicides, adjuvants, surfactants and dyes used by Byron Shire Council

Herbicide	Active constituent	Use
Glyphosate 360 (e.g. Round-up™, Weedmaster™)	Glyphosate 300 – 500 g/l	All areas
Metsulfuron methyl (e.g. Brush-off™, Associate™)	Metsulfuron 600 g/kg	All areas
Surfactant (e.g. Pulse)	1020 g/L Polyether modified polysiloxane	All areas
Adjuvant (e.g. Protech)	700 g/L Canola Oil Esther	All areas
Herbicide (e.g. Herbi Red-Liquid Dye™ Herbi Blue-Liquid Dye™)	160 g/L Red AC AZO DYE (RED), 90 g/L ACID BLUE DISODIUM SALT (BLUE)	All areas
Kamba A	340 g/L Methyl-Chlorophenoxyacetic acid	Parks and playing fields
MSMA (e.g. Monopoly™)	720 g/L Monosodium Methanearsonate (MSMA)	Playing fields
Diclofop Methyl	375 g/L Diclofop-Methyl	Playing fields
Sempre (Halosulfuron methyl)	720 g/L Halosulfuron Methyl	Playing fields
Jolt	300 g/L MCPA	Parks and playing fields

4.4 Weed Management Areas

4.4.1 Bush regeneration

The Bush Regeneration Team delivers significant ecological outcomes addressing threatening processes to conservation values including threatened fauna, flora and endangered ecological communities. The team use a range of weed control techniques demonstrating an integrated weed management approach. Weed control methods include: manual removal by hand weeding and crowning, cut and paint using herbicide for woody weeds, stem injection of large tree weeds and foliar spraying of herbicide. Trials in the use of biological control have also been investigated for Bitou Bush and Madeira Vine. Appendix G provides an information profile on a restoration site at Fern Beach where integrated weed management has resulted in successful biodiversity outcomes.

Herbicide used by the bush regeneration team occurs within five categories of land-use, as summarised at Table 4.3. Figures 4.2 – 4.3 summarise herbicide usage within various management areas by the bush regeneration team during 2013 and 2014. Note: MM has been graphed separately as it is a powder (measured in grams).

Use of glyphosate and other adjuvants is reasonably consistent between years, however MM use was significantly greater in 2014. Higher amounts of herbicide used at STPs during 2014 occurred as a result of poisoning stands of mature Camphor Laurel and the preparation (and management of) a new restoration area. Under normal operations, herbicide use at STPS would be substantially lower.

Table 4.3 Summary of bush regeneration works



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Area	Comments
Dune management	The bush regeneration team manages a number of coastal dune communities across the Shire. In 2014 the team was managing seven coastal dune sites including Brunswick Heads, Cavanbah, North Head Road, New Brighton dunes, New Brighton turtle planting, Fern Beach and Suffolk Park.
Road reserves	Road reserves account for the most extensive area managed by the bush regeneration team. In 2014 weeds were controlled at 13 road reserve sites including Bangalow Rd/Ironbark Ave, Coorabell Rd, Dry Creek Rd, Eureka Rd, Huonbrook Rd, Left Bank Rd, Main Arm Rd, McLeods Shoot, Ruskin Street water tower, Upper Main Arm picnic area, Kings Rd, Natural Lane and Taylors Lake Rd.
Rural bushland	Rural bushland accounts for the smallest area managed by the bush regeneration team; in 2014 only two sites were worked (Huonbrook and Pioneer Bridge).
Sewage Treatment Plants (STP)	Bush regeneration works take place at three STP's including West Byron, Brunswick Valley and Ocean Shores.
Urban bushland	Urban bushland accounts for the largest area maintained by the bush regeneration team. In 2014 works occurred at 23 sites including Bottlebrush Crescent, Broken Head Road/Beech Drive, Brunswick Heads Boat Ramp, Byron Cemetery West, Caniaba Crescent, East Beachcomber Drive, Federal Park, Honeysuckle Hill, Lilli Pilli Swamp, Mullumbimby Football Club, Mullumbimby Horse Paddock, North Beachcomber Drive, North Ocean Shores, Paterson St Water Tower, Skinners Shoot Library Compensation, South Cemetery Road and Yallakool.



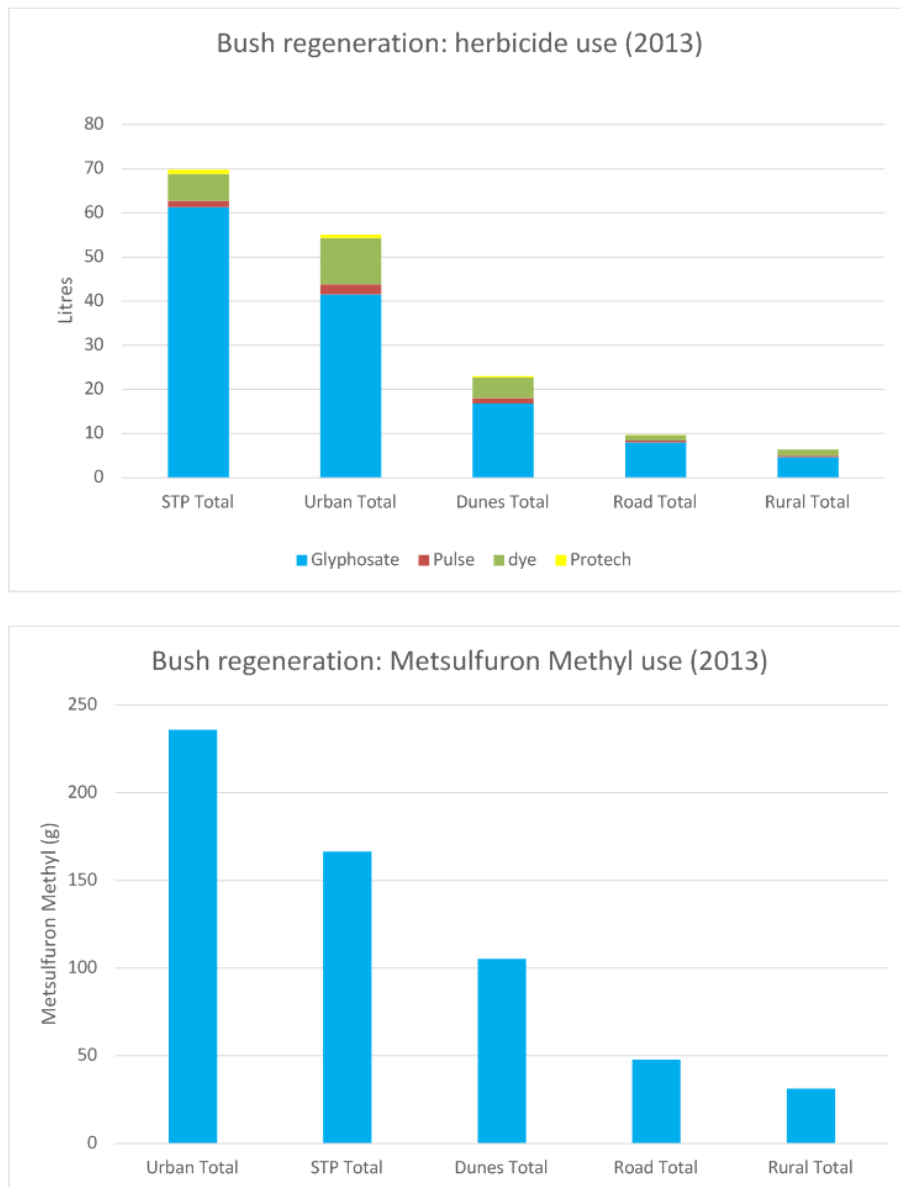


Figure 4.2 Bush regeneration: herbicide usage by management area for the 2013 period

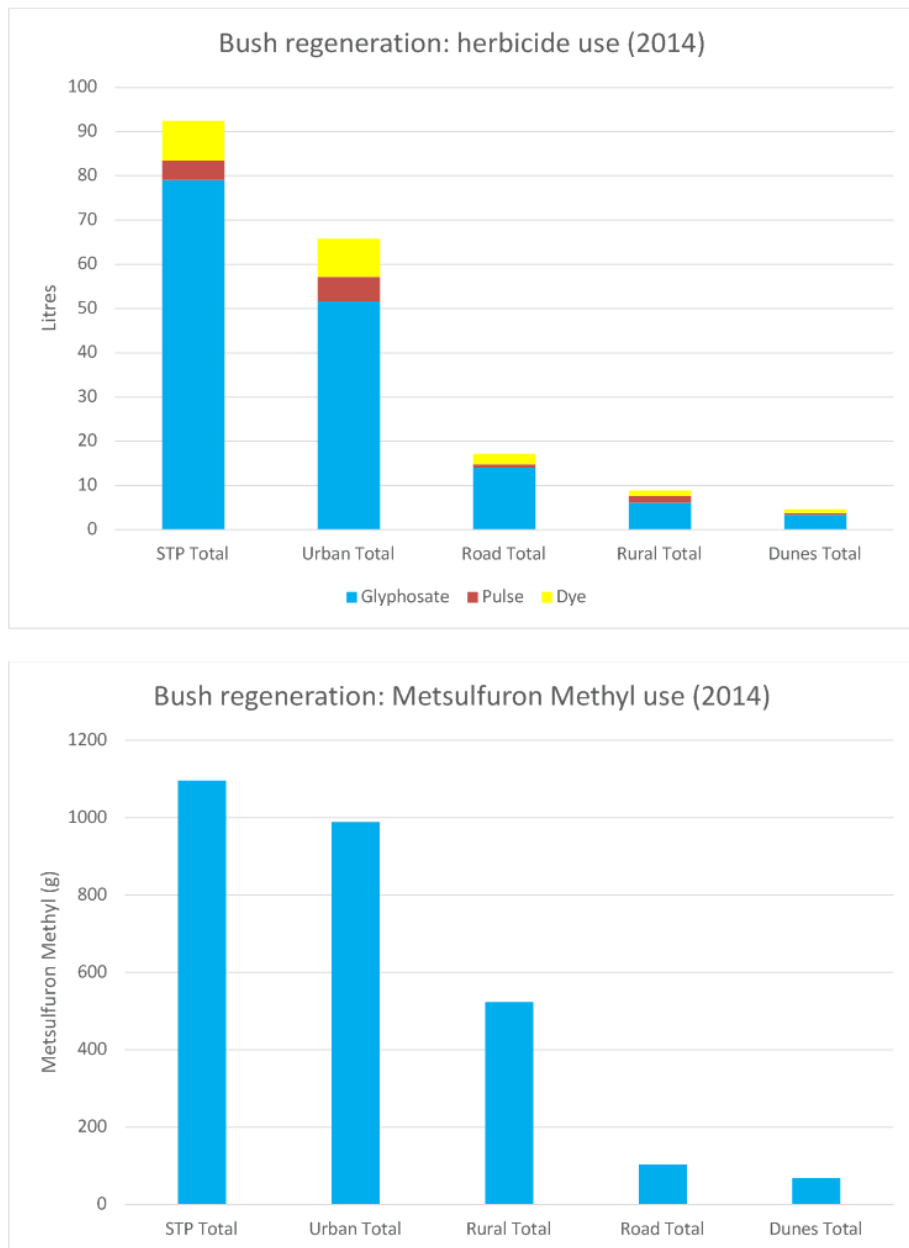


Figure 4.3 Bush regeneration: herbicide usage by management area for the 2014 period

4.4.2 Parks, reserves, cemeteries and amenities

4.4.2.1 Council

Weed control within 'open space' areas (i.e. parks, reserves, cemeteries and amenities) comprises a variety of techniques ranging from hand removal, slashing and herbicide use (from hand application to foliar spraying). Where herbicide is required, a combination of general purpose herbicides (e.g. using Glyphosate, MM) and selective herbicides specific for turf management are used. Weed control in open space areas occurs within 13 separate categories and takes place at 284 individual sites across the Shire (refer Table 4.4) and includes both 'passive' and 'active' open space areas. Passive open space includes the majority of land uses maintained by Council where community use is not actively encouraged (e.g. by provision of facilities). In contrast, active open space includes areas where facilities are specifically provided and a high level of community use occurs, such as for playing fields and parks.

As Table 4.4 indicates, roadsides and parks comprise the majority of public sites maintained by Council. Roadside maintenance must maintain a safe environment for road users, ensure clear lines of sight and allow for infrastructure within a dynamic and disturbed environment. In this way roadsides have their own unique challenges where multiple needs (safety, asset maintenance, weed control, biodiversity) must be balanced within highly disturbed environments. Typically any complaints about herbicide use received by Council relate to roadside management. Similarly, playing fields are a challenge to manage as they are dynamic and disturbed environments which are often in high demand, and where high usage rates may result in high rates of 'wear and tear' which exacerbates conditions for weeds to establish.

Table 4.4 Areas managed for weed control by the Infrastructure Services team

Park/Road Description	Methods	No. sites in Shire
Roadsides	Ride on + Slasher	74
Roadside entrance	Ride on	7
Sports fields	Ride on	9
Parks	Ride on + Slasher + Spot Spraying	104
Beach access	Pruning + Ride on	9
Mixed Crown/Council lands	Ride on	3
Crown Council lands	Ride on + Slasher + Spraying	28
Laneways	Not specified	1
Easements	Slasher + Ride on	23
Drainage easements	Slasher + Ride on + Over spraying	13
Cemeteries	Slasher + Ride on + Spot Spraying	4
Airfield	Ride on	1
Asset Protection Zones	Slasher + Ride on	7
Operational maintenance	Slasher	1

Council's Parks division infrequently uses selective herbicides to maintain turf surfaces (refer Table 4.5). Selective herbicides are only used on A grade couch playing fields (ie. Byron Recreation grounds Field 1, BRSCC (Ewingsdale), Jeff Schneider Oval (Bangalow) and rarely at Apex Park and Railway Park) to target specific weeds including Crowsfoot Grass, Nutgrass and Mullumbimby Couch. A focus of high quality sportsfield maintenance is controlling tussock forming weeds which can be a safety issue (i.e. create a tripping hazard) and which compromise the quality of the playing



surface (refer information profile attached at Appendix G). Council also uses the registered insecticide Confidor to control pest insects in gardens and parks.

Table 4.5 Herbicide use within public areas of Byron LGA

Product	Where used
Barricade	Turfed surfaces (open space)
Confidor	In the past Confidor was sprayed on Tuckeroo to control scale; Pandanus were also injected to protect against leaf hopper. When scale control is necessary Council now use Confidor in a pill form (Trade name: Initiator) which is installed around the drip line of the affected tree.
Diclofop Methyl	Couch playing fields
Glyphosate	Used across all management areas (sometimes in combination with Metsulfuron-methyl)
Herbi Dye (indicator dye)	Used in combination with Glyphosate/MM
Jolt	Turfed surfaces (open space)
Kamba M	Specifically used for bindii control within open space areas; usually applied July/August.
Metsulfuron	Used across all management areas (sometimes in combination with Glyphosate)
MSMA	Used on high profile couch sports fields (Byron Rec No 1, Schneider field at Bangalow and BRSCC to control Paspalum, Summergrass and broadleaf weeds.
Protec (surfactant)	Used in combination with Glyphosate/MM
Pulse (surfactant)	Used in combination with Glyphosate/MM
Sempra (Halosulfuron methyl)	Used at the BRSCC to control sedges in 2013; a repeat treatment on the back fields is now due. Also used on the wicket square at Brunswick Heads approximately twice a year to suppress Nutgrass; used in garden beds in Byron Bay to suppress Nutgrass.

Weed control is completed via spraying usually twice annually, however some herbicides require three applications for a single treatment. BSC report E2013/56622 *The Use of Herbicide in Public Area Management* stated that:

"The couch fields are treated with a selective herbicide once to twice a year, if a particular weed proves persistent it may require 2 – 3 treatments before it is controlled. The non-couch fields are not treated beyond targeted bindii spraying. Not all fields require this."

Figures 4.4 – 4.5 summarise selective herbicide usage within open spaces and roadsides during the 2013-2014 and 2014-2015 period. For the 2014-2015 data provided has been grouped as shown and hence cannot be easily split into its constituents. MM usage varied between 220 grams in the 2013-2014 period and 301 grams in the 2014-2015 period.

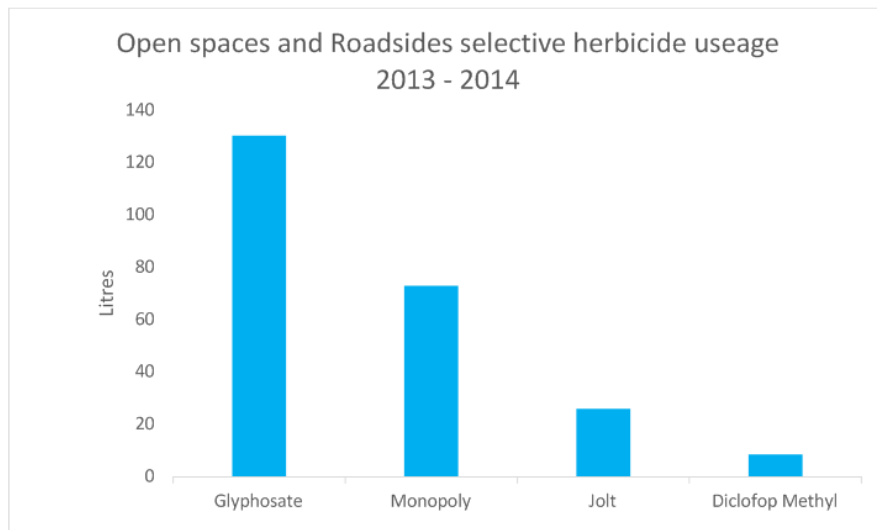


Figure 4.4 Summary of herbicide usage in open spaces and roadsides 2013-2014

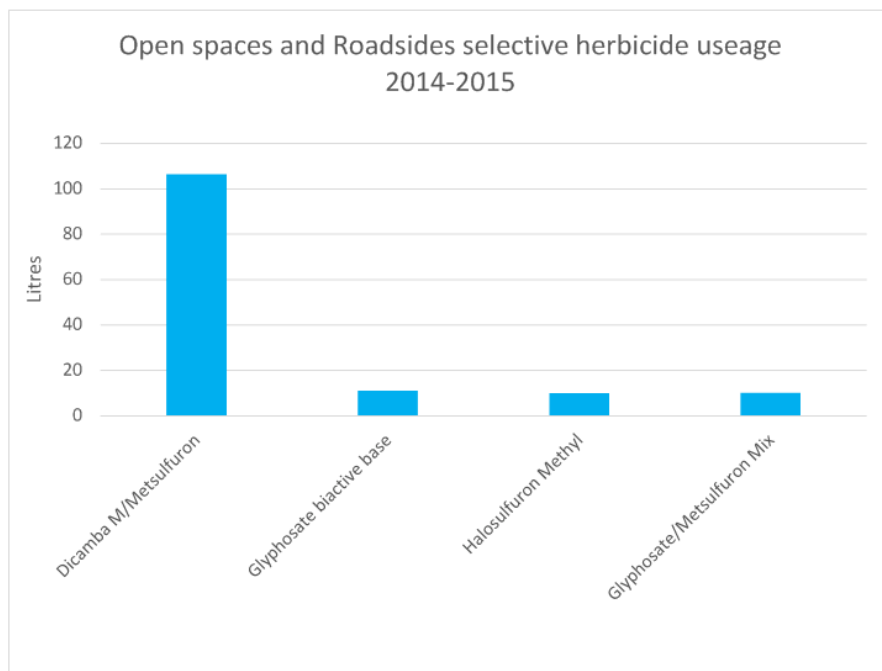


Figure 4.5 Summary of herbicide usage in open spaces and roadsides 2014-2015

4.4.2.2 Contractors

Council contracts out various aspects of weed control including:

- Roadsides (including guideposts, edges, kerbs),
- Cemeteries and parks (for Bindii), and
- Sports fields (couch surfaces) for non-couch species.

All contractors supply Council with herbicide record sheets based on work completed. Herbicide data sheets for 2012 and 2013 supplied to Council are summarised at Table 4.6.

Table 4.6 Herbicide use by contractors (2012-2013)

Year	Product	Amount used (litres)
2012	Dicamba M	10.85
2013	MSMA	51

A large quantity of MSMA (5 litres) was used in 2013, a significant amount given the product is a Schedule 7 poison of high toxicity. No contractor data for 2014 was provided and it is unclear whether further MSMA use has occurred since this time.

4.5 Herbicide application methods

Council employs a range of methods for herbicide application in order to selectively and strategically control weeds and minimise off target damage to native flora. Methods of herbicide application are varied and are primarily dependent on the subject weed to be treated. Weed control methods commonly used on Council managed land include foliar spraying (spot spray or overspray), cut scrape and paint/scrape and paint and stem injection (refer Appendix H for further information).

Other neighbouring Councils in proximity to Byron Shire were contacted to determine weed control methods they utilise as part of their daily operations (refer Appendix I). Generally current methods and practice appear in alignment with those practiced within Byron Shire.

4.6 Risks associated with herbicide application

Risks associated with herbicide application are typically managed by 'best practice' management as per the *Chemcert accreditation training manual* (2012). The Manual provides guidance on appropriate Personal Protection Equipment (PPE), interpreting Material Safety Data Sheets (MSDS), identifying risks to humans and the environment and mitigation measures to avoid hazards. Typically risks to the operator, the public and the environment increase where flexibility and control of the application method are reduced. For example wick wiping is targeted and flexible and can be completed with some sensitivity, whereas foliar spraying is more indiscriminate and operators have less control over herbicide application; these risks are considered in Table 4.7.

Table 4.7 Summary of risks and mitigation associated with herbicide applications used by Council

Herbicide and application method	General risks	Risk to public	Mitigation
Foliar spray (hand-spraying)	<ul style="list-style-type: none"> • Spray drift – contamination 	High – greatest risk of	<ul style="list-style-type: none"> • Spraying in low



Herbicide and application method	General risks	Risk to public	Mitigation
	<ul style="list-style-type: none"> of waterways, drift into private properties, 'off target' impacts on adjacent vegetation, fauna and community members. Operator contact with herbicide. 	herbicide exposure.	<ul style="list-style-type: none"> wind conditions. Using appropriate spray nozzle. Wearing PPE as appropriate.
Foliar spray (from vehicle or boom)	<ul style="list-style-type: none"> Spray drift (as above). Higher chance of 'off target' impacts due to less flexible control. 	High – greatest risk of herbicide exposure, except where shrouded booms are used.	<ul style="list-style-type: none"> Spraying in low wind conditions. Using a shrouded boom to reduce spray drift (turfed surface only).
Hand application (eg: cut and paint)	<ul style="list-style-type: none"> Herbicide spillage. Operator direct contact with herbicide. 	Low – minimal risk of herbicide exposure.	<ul style="list-style-type: none"> Wearing PPE as appropriate.
Stem injection	<ul style="list-style-type: none"> Herbicide spillage. Operator direct contact with herbicide. Operator injury from drill/chainsaw. 	Low – minimal risk of herbicide exposure.	<ul style="list-style-type: none"> Wearing PPE as appropriate.
Wick wiping	<ul style="list-style-type: none"> Herbicide spillage. Operator direct contact with herbicide. 	Low – minimal risk of herbicide exposure.	<ul style="list-style-type: none"> Wearing PPE as appropriate.

In summary, foliar spraying is the herbicide application method where human or environmental exposure is most likely as large areas are treated and there is potential for spray drift. Sprayed herbicide may also take longer to dry when a larger droplet size is used, hence any 'wet' areas present an opportunity for human contact. Use of coloured dyes to indicate spraying has been completed is a preventative measure to reduce this risk. Conversely, targeted methods such as stem injection or 'cut and paint' techniques deliver small amounts of herbicide directly to the stem of a plant which is typically quickly absorbed, significantly reducing the potential for contact with the public and/or environment.

4.7 Herbicide toxicity

Herbicide toxicity is the degree to which herbicide can damage an organism or substructure of an organism. Herbicide users and those in the vicinity of chemical usage risk of personal exposure by various pathways including splash and spillage resulting in dermal contact, or inhalation due to spray drift. Figure 4.6 illustrates the absorption rates of chemicals into various areas on the human body relative to the forearm, and identifies the eyes and the groin area as the areas of the highest chemical uptake, approximately 12 times higher than that of the forearm.

Exposure to herbicide toxicity may result in either acute poisoning or chronic poisoning. Acute poisoning generally occurs via direct dermal contact (through the skin), inhalation or ingestion, and immediate symptoms of poisoning are usually evident. Chronic poisoning refers to repeated exposure to chemicals over time where chemicals may concentrate in the body and adversely affect health.

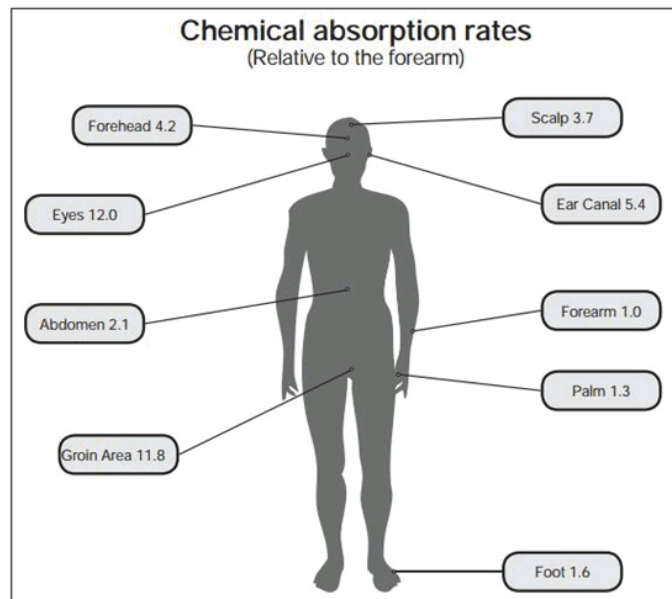


Figure 4.6 Illustration of chemical absorption rates in the human body [Source: Chemcert education manual]

Manufacturers of any chemical in Australia are required to produce and supply Material Safety Data Sheets (MSDS) with each product providing information on the chemical make-up and toxicity of the product and any specific medical information in the event of consumption or contact. All registered product labels must contain a minimum degree of information, including information describing the poison schedule of the product (the 'Signal Heading'), the type of chemical, the active constituents of the product, directions and use, advice for the protection of the environment, and first aid and disposal advice.

Note: MSDS require adequate information on the impacts of chemicals on human health (and/or including potential impacts to companion animals), however there is no requirement for data to be provided on any environmental impacts of the product (e.g. impacts to water, soil, insects and macro-invertebrates etc.), other than the precautionary information on the product label (e.g. general advice provided for the protection of wildlife, fish, crustaceans and the environment). This information has been included in the chemical profiles in Appendix F as this is understood to be a key concern of some community members.

For more information on interpreting herbicide labels refer to *Understanding Pesticide Chemical Labels* produced by APVMA (2011) - http://archive.apvma.gov.au/use_safely/understanding_labels/index.php

The toxicity of registered herbicides is stated by the Signal Heading on the product label (refer Table 4.8), which may relate to either acute or chronic poisoning potential. For example, some pesticides may be rated as a Schedule 7 DANGEROUS POISON due to the mutagenic and/or carcinogenic potential from chronic exposure, whereas others may be classified as a Schedule 5 poison due to the potential of skin and/or eye irritation resulting from dermal (skin) contact.

Table 4.8 Signal headings (ie. poison schedules) for approved pesticides (Source: APVMA)

Signal Heading	Poison schedule	Definition
No signal heading	N/A	The chemical is 'unscheduled' and is very low in toxicity and unlikely to cause harm to humans, provided it is used in accordance with label directions.
CAUTION	5	Chemicals of low toxicity and available to the public but require caution in handling, use and storage.
POISON	6	Chemicals of moderate toxicity and available to the public and also require caution in use, handling and storage.
DANGEROUS POISON	7	Chemicals of high to very high toxicity. These pesticides are extremely hazardous and dangerous to health and have a high potential for causing harm at low exposures. They require special labelling, handling and use and are not available to the general public.

Of the pesticides used by Council and/or its contractors (refer Table 4.9):

- Six pesticides are unscheduled (i.e. very low toxicity)
- Five pesticides are Schedule 5 poisons (low toxicity)
- One pesticide is a Schedule 6 poison (moderate toxicity)
- One pesticide is a Schedule 7 poison (high toxicity)

In terms of potential impacts on human health, MSMA is the most toxic herbicide used by Council and is used sparingly for the selective control of tussock grasses such as Paspalum and Kikuyu.

Table 4.9 Summary of toxicity of herbicides and surfactants used by Council and contractors

Product	Poison Schedule	Application
Barricade	Unscheduled (very low toxicity)	Turfed surfaces
Confidor	Schedule 5 (low toxicity)	Gardens/landscaping
Diclofop Methyl*	Schedule 6 (moderate toxicity)	Turfed surfaces (Target species: Crowsfoot Grass)
Glyphosate	Schedule 5 (low toxicity)	Bush regeneration, open space management
Herbi Dye	Unscheduled (very low toxicity)	Bush regeneration
Jolt	Schedule 5 (low toxicity)	Turfed surfaces
Kamba M	Schedule 5 (low toxicity)	Turfed surfaces
Metsulfuron-methyl (MM)	Unscheduled (very low toxicity)	Bush regeneration, open space management
MSMA*	Schedule 7 (high to very high toxicity)	Turfed surfaces (Target species: Paspalum and Kikuyu)
Protec	Unscheduled (very low toxicity)	Bush regeneration
Pulse	Unscheduled (very low toxicity)	Bush regeneration, open space management
Sempre	Schedule 5 (low toxicity)	Turfed surfaces (Target species: sedges – Mullumbimby Couch, Nutgrass)
*Only applied by specialist contractors, not Council staff		

A summary of Schedule 5, 6 and 7 pesticides is provided in the following Sections.

4.7.1 Glyphosate

Glyphosate is a Schedule 5 (low toxicity) poison and is likely to irritate eyes and skin if dermal or eye contact occurs. Although previous studies have found glyphosate to be negligible when considering chronic build up due to long term repeated exposure (Mink *et al.*, 2011; Mink *et al.*, 2012; Williams *et al.*, 2012), recent studies based on epidemiological evidence conducted by the International Agency for Research on Cancer (IARC) (a subsidiary body of the World Health Organisation) classified Glyphosate within the 2A group 'probably carcinogenic to humans'.

Interestingly, the IARC findings are challenged by the (European Union) Federal Institute for Risk Assessment (BfR), based on an evaluation of over 30 epidemiological studies which concluded there is no validated or significant relationship between exposure to glyphosate and an increased risk of non-Hodgkin lymphoma or other types of cancer (BfR, 2015). The BfR has stated that it will review the supporting evidence (known as the 'background monograph') when it is released by the IARC.

In response to the IARC declaration, the APVMA have provided advice as follows (30/03/2015):

"The IARC assessment looks at the intrinsic 'hazard' of the chemical glyphosate as a cancer-causing agent only. Other components of the toxicity of glyphosate are not taken into account. As part of the regulatory process, a hazard assessment is just one part of the overall risk assessment required to determine the risks for people using a formulated chemical product.

It is not the role of the IARC to consider how a formulated chemical product is used, or how human exposure can be minimised by following safety directions on a product label. In this regard, the findings of IARC cannot be directly compared to assessments conducted by regulatory authorities for the purposes of approval or registration of a pesticide product, in which are included appropriate risk mitigation measures to allow safe use".

As the regulatory authority, the APVMA states it considers the full range of risks (including studies of cancer risk) and how human exposure can be minimised through instructions for use and safety directions. The APVMA will examine the basis for the IARC classification in collaboration with the Office of Chemical Safety in the Department of Health, when the full monograph is published before determining whether any regulatory action is necessary, including whether glyphosate should be formally reviewed. In the interim, advice on Glyphosate remains unchanged.

An APVMA commissioned study completed by Scitox Assessment Services (2013) to review a report suggesting a link between glyphosate and birth defects concluded that:

1. *The APVMA currently has no data before it suggesting that glyphosate products registered in Australia and used according to label instructions present any unacceptable risks to human health, the environment and trade.*
2. *The weight and strength of evidence shows that glyphosate is not genotoxic, carcinogenic, or neurotoxic.*

It should be noted that by comparison, a number of other common agents (either substances or practices/occupations) are listed in the carcinogen schedules of the IARC, including Bracken Fern, diesel, Aloe vera, bacon and smoked small goods (refer Appendix J for further information).

In response to the IARC listing Tweed Shire Council has provided advice to its employees regarding the use of Glyphosate in the interests of Work Health & Safety (refer Appendix K) stating that the report produced by the IARC indicated that there was limited evidence suggesting that Glyphosate



is carcinogenic to humans and that the recent classification of 2A by the IARC indicated that, in scientific terms, evidence could not be established whether Glyphosate is or is not carcinogenic to humans. The Tweed Shire Council advice also stated *'There is not one global regulatory agency [EU, USA, UK, Canada, Aus, Germany] that has changed the classification of Glyphosate to a probable carcinogen. Hazard warnings for Glyphosate remain as:*

- *Causes serious eye damage (irritant and corrosive),*
- *Toxic to aquatic life with long lasting effects.*

In response to the IARC listing Councils insurer has issued a factsheet (attached at Appendix L) which sets out recommended actions to ensure glyphosate is used in a safe manner in accordance with best practice guidelines.

It should be noted that Glyphosate is rarely used in its base form without the addition of surfactants, penetrants or dyes. For example, drilling and injecting trees with a dilute Glyphosate solution represents the most 'pure' form of application, and when delivered in this manner there is minimal spillage and potential for spread beyond the immediate site of works. In contrast, hard to kill weeds may be treated by spraying a mixture of Glyphosate and various additives – for example a mixture of metsulfuron-methyl + glyphosate + penetrant. There appears little information on the toxicity of these mixtures and any potential for health or environmental impacts.

An Argentinian study (Lajmanovich *et al.*, 2013) on the effects of several commercial formulations of common herbicides on the common toad noted that: *"...mixture toxicity is far more complex than simple addition. Greater toxicity may be due not only to the toxic effects of the herbicides themselves but to supposedly inert additives such as a surfactant"*. The study concluded that single-chemical assessments systematically underestimate the actual risks to amphibian species in waterbodies where mixtures of herbicides potentially occur. The results of the study found a Glyphosate-Metsulfuron Methyl mixture to be the least toxic of three tested mixtures. Interestingly, for three differing toxicity scenarios on tadpoles, Glyphosate had greater impact than the Glyphosate-Metsulfuron Methyl mixture.

4.7.2 Metsulfuron methyl

Metsulfuron-methyl (MM) is an unscheduled (very low toxicity) herbicide and is a systemic compound with foliar and soil activity which works rapidly after plant absorption. It works by inhibiting cell division in the shoots and roots of the plant and is biologically active at low use rates. Potential health effects of contact with MM may include:

- Ingestion: slightly toxic,
- Eye contact: eye contact may cause irritation (tearing, pain, blurred vision), and
- Skin contact: repeated skin contact may cause skin irritation (itching, burning, redness, swelling, rash).

MM labelling states it has low potential environmental effects, being *'practically non-toxic to fish, birds and bees'*. Because MM has residual activity in soils, it is necessary to allow sufficient time for the chemical to break down before planting certain crops.

4.7.3 Jolt

Jolt is a Schedule 5 (low toxicity) poison which is harmful if swallowed and may damage the eyes and skin if contact occurs. The principal ingredient (MCPA) is a systemic hormone-type selective herbicide, readily absorbed by leaves and roots. IARC carried out a comprehensive evaluation



related to occupational exposures to chlorophenoxy herbicides (which include MCPA), which were considered to show "limited evidence" of carcinogenicity (IARC, 1986).

4.7.4 Dyclofop Methyl

Dyclofop Methyl is a Schedule 6 Poison which is very hazardous to human health. Acute poisoning may occur from dermal contact or ingestion. Studies conducted by Ünal *et al.*, (2011) identified Dyclofop Methyl to be cytotoxic and genotoxic in human lymphocytes and mouse bone marrow. This indicates that long term repeat exposure may result in serious health impacts. It must be noted that this herbicide was in use by Council workers at most 3 times per annum to treat weeds in turf surfaces (Crowsfoot Grass is a target species) however the use of this chemical has been discontinued by BSC due to it not being effective on crowsfoot grass.

4.7.5 Semptra

Semptra™ is a Schedule 5 poison; like other sulfonylurea herbicides, halosulfuron-methyl has a low acute toxicity following dermal, oral or inhalational exposure and can cause eye and skin irritation. Although there is limited information available regarding the toxicity of halosulfuron-methyl products, APVMA (2011) indicate that studies conducted prior to 1994 showed no consistent indications of any particular target organ toxicity in repeated dose studies in rats, mice or dogs and that Halosulfuron-methyl was not carcinogenic or genotoxic and did not affect fertility in studies over two generations in rats (APVMA, 2011).

4.7.6 MSMA

MSMA is a Schedule 7 (high toxicity) poison which can result in fatality if ingested and/or exposed to sensitive areas of the body. Repeated long term exposure of this herbicide may lead to reduced reproductive capabilities (Prukop & Savage, 1986). MSMA is applied by licenced contractors only, with shrouded spray equipment.

4.7.7 Kamba M

Kamba® M is specifically used for bindii control and is a Schedule 5 poison. The product may cause severe irritation of the eyes and mild skin irritations if contact occurs, with the concentrate form of Kamba being harmful if swallowed.

4.7.8 Confidor

Confidor is used for or the systemic control of insect pests on flowers, shrubs and trees and is a Schedule 5 poison. The product may be harmful if inhaled, may irritate the skin and eyes and is harmful if swallowed. The risk of health issues has been largely negated as the current practice is to administer via pills.

4.8 Environmental impacts of herbicide

APVMA labelling does not require any specific information with regard to environmental impacts which may result from herbicide use, other than providing cautions with regard to livestock and or aquatic impacts. This information is cursory and provides little information on what the environmental impacts (particularly long term impacts) of herbicides may be. It is understood that the negative environmental impacts of herbicides is a key concern of those who may question herbicide use. Negative environmental impacts of herbicide uses may include:



- Contamination of waterways,
- Off-target damage to native vegetation (either directly or by uptake),
- Impacts on aquatic life (fish, frogs/tadpoles, macroinvertebrates),
- Impacts on soil,
- Impacts on soil vertebrates, and
- Impacts on soil fungi and processes.

There appears few studies on several herbicides used by Council, with the main environmental studies focusing on glyphosate and MM; these are considered in the following sections.

Note: the studies cited below are just a snapshot of many relevant studies. Review of all environmental impact studies of glyphosate is beyond the scope of this Strategy. Further, studies concerning agricultural contamination and farming impacts have not been considered as these impacts, while of concern, have little relevance to high use public areas.

4.8.1 Glyphosate

An American study on the impacts of herbicides on aquatic communities (Relyea, 2005) found that glyphosate (with a surfactant added) reduced tadpole richness by 70%, but did not have significant impacts on other aquatic life (toads, salamanders, insects and snails). It was not stated whether this study used 'standard'; glyphosate or one of the 'frog friendly' forms of the herbicide.

An Australian study of several glyphosate formulations on frogs (Mann & Bidwell, 1999) found the active ingredient (glyphosate IPA) used in commercial glyphosate formulations (Roundup®, Roundup Biactive®) was nontoxic. However, the surfactant ingredient in commercial glyphosate preparations was identified as being responsible for its toxicity, with Roundup Biactive® being 100 times less toxic than Roundup® in the most sensitive frog species. While the study acknowledged that glyphosate formulations entering aquatic environments may not present a hazard due to dilution in a large environment, it was acknowledged that in shallow lentic or ephemeral water bodies, the concentration of active surfactants may reach toxic levels.

An Australian study on the impacts of glyphosate on leaf litter invertebrates within Bitou Bush (Lindsay & French, 2004) did not identify any significant direct or indirect effects on leaf litter invertebrate abundance or community composition in four months following herbicide application. Litter invertebrate assemblages were found to be highly variable on a small spatial scale, with abiotic factors more strongly regulating invertebrate numbers than glyphosate application. These results conflict with previous studies, indicating that the detrimental indirect effects herbicide application has on non-target litter invertebrates may depend upon the application rate, the vegetation community and structure and post-spray weather.

A study focusing on the use of glyphosate for bush regeneration (Nakamura *et al.*, 2008) found that use of 'frog friendly' glyphosate (Roundup Biactive®) sprayed at a higher rate of typical application did not have significant impacts on macro arthropods. The study concluded that glyphosate had minimal impact on assemblages of soil and litter arthropods within intact rainforest communities, most likely to due to the low toxicity of glyphosate and that the product is inactivated in the field by adsorption to soil and organic matter and by decomposition by micro-organisms. Nakamura *et al.* (2008) note that Roundup Biactive® contains a surfactant of reduced toxicity which may have influenced the survey outcomes; further additions of other surfactants in the field (such as POEA based surfactants such as Pulse) may result in different environmental outcomes.



A similar study on microbial community structure in forest soils also recorded no major changes in microbial community structure following the addition of the recommended field-rate concentration of glyphosate (Ratcliff *et al.*, 2006).

4.8.2 Metsulfuron-methyl

A similar study to the bitou bush experiment (Lindsay & French, 2004) completed using Metsulfuron-methyl (French & Buckley, 2007) followed changes in litter invertebrates for 125 days following application of MM to investigate the direct toxic and indirect effects of treatment. Overall, no effect of the treatment on the abundance, taxonomic richness or composition of litter invertebrates was found. In general, abundance and richness declined with time in both treated and untreated sites, suggesting that climatic factors were far more important in determining invertebrate communities than the effects of the treatment.

A study in far north Queensland (Spencer, 2012) determined that MM was very suitable for the control of Singapore Daisy, where of 78 native flora species exposed to MM, 17 (22%) were killed following a spray application that would reliably kill the Singapore Daisy. Native sensitive species were generally soft leaved pioneer species that could readily re-colonise the area once Singapore Daisy had been removed. The study concluded that native plant resistance permitted an easier approach to weed control, as the extreme care required to avoid spraying native seedlings could be relaxed. MM was also revealed to be a highly effective herbicide for controlling a wide variety of other serious environmental weeds, including lantana and syngonium (Note: both these latter species occur in the Shire).

The toxicology of MM was tested in a study of aquatic systems, with the study confirming that exposure to MM at concentrations which may occur in water bodies adjacent to agricultural land following normal agricultural practice can induce alterations in the ecology of aquatic ecosystems, particularly in macrophyte-dominated waters (Wendt-Rasch *et al.*, 2003).

A study on the effects of MM on soil microbial activity indicated that MM had no adverse effect on soil microorganisms. The study concluded that the lack of interference with soil biological processes would suggest that sulfonylurea herbicides have little or no harmful effect on soil microbial action when applied at lower rates (Radivojević *et al.*, 2014).

4.9 Contractors

Where possible and particularly in close proximity to residential areas Council use one contractor based on their specialised equipment (shrouded booms) which limits spray drift (refer Plate 4.1). The DriftProof system prevents spray drift (due to shrouded booms), with droplets confined to the target area. According to the manufacturer, the controlled nature of this technique results in less product being applied. These vehicles are equipped with turf tyres which makes them suitable to use at the Cavanbah centre and also at the Recreation Fields in Byron township. Another contractor is employed to maintain the park network based on their detailed knowledge and ability to operate in the early hours of the morning.

Both contractors were contacted to discuss issues associated with the Strategy, with both confirming that:

- Liaison with Council was completed prior to works so appropriate notification could be provided (as per the PUNP).
- Warning signage was placed on site prior to any herbicides being used, with signage removed following the application period. No 're-entry' period signage is provided unless

the product specifically requires this (does not apply to any of the selective herbicides used).

- Use of sensitive methods is a key consideration based on the situation (e.g. shrouded boom, wick wiping).
- Works were done during weekdays and early in the morning to reduce potential for human contact. For sportsfields this avoids any later usage which is typically in evenings or on weekends.

Minimal water rates are used to ensure quick drying of the product to minimise potential for transferral (this is indicated by use of marker foams when boom spraying where the product may be dry within 20 – 60 minutes).



Plate 4.1 Image of DriftProof spray equipment used by Council contractors (Source: Technigro)

4.10 Herbicide use summary

Based on the preceding information, the advantages and disadvantages ('pros and cons') of herbicides commonly used by Council and contractors is summarised at Table 4.10.

Table 4.10 Summary of advantages and disadvantages of herbicides used by Council and/or contractors

Weed control method	Requirement	Pro	Con
Glyphosate	Glyphosate: water mix (plus adjuvants as required – Pulse, herbicide etc) Ratio between 200:1 – 50:1 spraying or 1:1 cut and paint	<ul style="list-style-type: none"> • Cost effective. • Quick and easy to apply. • Effective on a wide range of weeds. • Proven results in improving biodiversity values. 	<ul style="list-style-type: none"> • Schedule 5 herbicide. • Probable carcinogen. • Community concern. • Possible long term health effects from repeat exposure. • Off target environmental impacts.
Metsulfuron-methyl	Mixed with water (or with Glyphosate)	<ul style="list-style-type: none"> • Cost effective. • Quick and easy to apply. • Low toxicity. • Selective herbicide therefore no off target damage. 	<ul style="list-style-type: none"> • Community concern re: environmental impacts (e.g. residue in soil).
MSMA	Mixed with water	<ul style="list-style-type: none"> • Cost effective. • Quick and easy to apply. • Selective therefore no off target damage. 	<ul style="list-style-type: none"> • Highly toxic (Schedule 7 herbicide). • Proven to be residual in soil. • Is mobilised in surface and ground water.
Other selective herbicides (Barricade, Jolt, Semptra Diclofop-methyl, Kamba M)	Mixed with water at various dilutions	<ul style="list-style-type: none"> • Cost effective. • Quick and easy to apply. • Selective therefore no off target damage. 	<ul style="list-style-type: none"> • Moderately toxic (Schedule 6 herbicides); except for Jolt (Schedule 5).

4.11 Weed control considerations

4.11.1 Statutory obligations

As noted, Council is obliged to manage noxious weed in accordance with the provisions of the *Noxious Weeds Act 1993*. Within reserves managed for environmental enhancement where EECs and/or threatened species habitat occurs, Council also has an obligation to control weeds where they are listed as a Key Threatening Process (KTP) in the TSC Act.

4.11.2 Public safety

Council ensures the safety of the public when completing weed control works by providing notification in advertising, signage and on its website in accordance with the *Pesticide Use Notification Plan*. As noted, people registered on the Chemically Sensitive Residents Register are specifically advised when weed control works are scheduled in proximity to their property. Public safety is also ensured when operators are working by the provision of signage advising that weed control works are occurring. Operators ensure that wherever possible, safe conditions for herbicide application occur with regard to weather (i.e. spraying in calm, dry conditions) or other conditions (e.g. working near roads or public places).

4.11.3 Protection of waterways

Protection of waterways/wetlands is ensured by several operational principles including: care by operators in terms of controlling spray drift, use of 'frog friendly' forms of glyphosate (e.g. Roundup Biactive™), and withholding spraying in conditions where rain is anticipated and run-off into watercourses may potentially occur.

4.11.4 Biodiversity

Weed control is completed in much of the Shire with a view to enhancing biodiversity values, particularly within road reserves. Councils GIS database (derived from a combination of staff records and records in the *Roadside Vegetation Strategy*) identifies sensitive habitat for threatened species and EECs to ensure that operators are aware of environmental values and the risk of accidental damage to threatened species habitat is reduced. Council has also erected road markers (marked 'HQR' – High Quality Remnant) along many road reserves to identify the location of threatened communities and flora.

4.11.5 Commitment

One of the major considerations regarding ongoing weed control is commitment of resources (staff, equipment, funding). Weeds re-establish rapidly and considerable resources are allocated to continuous ongoing weed control methods such as slashing. While some weed control operations may comprise a single targeted response (e.g. removal of a patch of Giant Devils Fig), this is rarely the norm. Vines in particular are difficult to control, and typically require repeated treatments over a period of time. Similarly, commitment is required by bush regenerators where they engage in major works such as poisoning Camphor Laurel, as there is invariably follow-up work required to control other weed species which may proliferate once the canopy is opened up.

Prior to engaging in any new weed control works in previously unmanaged areas, staff need to assess the likelihood of long-term follow up work and the resources required. This is a serious consideration and supports the notion that completing 'one off' treatments for aesthetic (or other reasons) may be a waste of resources if there is no commitment (or capacity) for follow up control.

4.12 Community groups



As noted, a number of community groups undertake weed control on Council managed land, ranging from casual groups or individuals who meet infrequently, to larger groups with a dedicated working schedule (by day/monthly), to larger affiliated Landcare Groups. Most Landcare and Dunecare groups working on council managed land work under the umbrella of Brunswick Valley Landcare (BVL), where BVL cover insurance and Work, Health & Safety (WHS) requirements and groups work autonomously once approval is received from Council. BVL have a signed Memorandum of Understanding (MoU) with Council formalising the relationship between both parties in recognition of the biodiversity works completed by volunteers on public lands within the Shire. Councils own bush regeneration team also work at many Dunecare sites, supporting works done by volunteers.

There is no formal requirement of volunteer groups to report details of work to Council, however Council maintains a good working relationship with most groups via the Community Support Officer employed by BVL. The range of weed control completed by groups varies between groups and sites, however a desire for reduced herbicide use would be considered a common ideal for most groups. Only one group identifies with a 'chemical free' philosophy, working on Crown managed land at Brunswick Heads.

Supporting data to determine the herbicide usage of community groups was not made available, however, given that community groups are small, may work sporadically (often in localised areas) and tend to support minimal herbicide use, it is likely that herbicide use by these groups would be negligible in comparison to that used for weed control completed by Council.

5 Alternative Weed Control Methods

5.1 Introduction

In Section 4 Councils existing weed control methods were analysed to determine the current basis of methods, how often herbicide is used and what herbicides are used. Section 5 examines potential alternative approaches which may have application in the Shire. Alternatives to chemical-based weed control methods may include a range of practices including mechanical control (slashing, brushing, brushcutting), thermal control (use of hot water, steam, flame, radiant heat) and other methods (freezing, UV and laser radiation). Weed control using 'eco-friendly' chemicals/products is another alternative.

Much of the research on alternative methods appears to be in New Zealand and Europe, with a particular focus on controlling weeds in hard surfaces (roads, paving etc) within cities and residential areas. This focus is based on the recognition that weeds can impact on hard surfaces by widening cracks and affecting product life, which may create safety issues, impede water flow, reduce visibility and be unsightly. These same issues affect areas of open space in Byron Shire where there is a practical need for weed control. When this is coupled with concerns from users of open space areas (including residents and tourists) on the use of herbicides around parklands and playgrounds, examination of alternative solutions is justified.

On a local scale, there appears to be few proven alternative methods – either using steam weeding or using environmentally 'friendly' products. The range of alternative weed control methods practiced in Europe is not widely available in Australia, and many of these practices are focused on cities where substantial areas of hard surfaces require active management. It is important to recognise that Byron Shire has its own unique challenges for alternative means of weed control, shared by neighbouring rural shires in northern NSW:

- There are few large towns and hence reduced areas of hard surfaces requiring high levels of maintenance (for example, weed control methods in inner Sydney where large areas of paving require treatment may have reduced application here).
- Urban centres (Byron Bay, Bangalow, Ocean Shores, Mullumbimby, Suffolk Park) are spread out and difficult to integrate with weed control practices.
- A wide range of persistent weeds occurs, ranging from grasses and herbs to weed trees.
- We live in a high rainfall area with fertile soils which result in enhanced conditions for weed growth.
- The dominant land use in the Shire is agriculture, a landuse which is synonymous with weeds (and therefore weed control).

Information on alternative weed control methods are presented in the following sections. It is acknowledged that this information may not be sufficient to enable informed decision making around the use of alternative weed control methods. For the purpose of this Strategy, investigation of alternative methods which are not commercially available (and for which there is little supporting information) is beyond the scope of this project.



5.2 Alternative herbicides

Alternative herbicides which are environmentally 'friendly' work in a different manner to herbicides such as glyphosate, as they are not systemic (i.e. translocated through the plant), but 'contact' herbicides, where they work through contact action with foliage, and the roots or rhizomes are not affected.

5.2.1 Pine Oil

Pine oil is a non-chemical organic herbicide in the form of an essential oil. Organic herbicides have a different mode of action when compared with chemical herbicides as they dissolve target structures causing the plant to desiccate/dry out. Pine oil has a broad range of applications including control of broadleaf weeds, annuals, grasses, noxious weeds, roots and weed seed. However, Pine oil is not able to control woody weeds.

Pine oil works most efficiently at controlling weeds in temperatures above 30° C when humidity is low. Unlike chemical herbicides which operate at the acidic (<7) end of the pH spectrum, Pine oil has a neutral pH (7), has no with-holding period following spraying and presents a low risk to operators. Bioweed™ is a pine oil product bio-certified in the USA, Canada and New Zealand and reportedly has no impact on soil-biota, micro-organisms, frogs, fish or birds, and risks to the operator and the community is low. Bioweed™ is registered under the APVMA and in concentrate form is a Schedule 6 poison (as it may irritate the skin and eyes in undiluted form).

Bioweed™ is applied by spraying in the same manner as conventional herbicides with a mixing rate for the product of 20%; 4 parts water to 1 part Bioweed™ (i.e. 10 litres of spray mixture comprises 8 litres of water and 2 litres of the product). The manufacturer states that higher dilution rates may be effective, such that a 10% mix may be effective.

Council completed a trial of pine oil in 2005 and compared usage of glyphosate with a pine-oil based product (Organic Interceptor [no longer manufactured]) and pool salt. The trial cited the following conclusions with regard to Organic Interceptor:

Organic Interceptor provided a rapid knock down but was not sustainable over time. Re-applications still did not provide the control required to manage species populations in the test area.

The efficiency of the product Organic Interceptor is therefore lower and the cost associated with the use of this product would be high due to the labour costs and other resources needed to deliver the product to the target sites on a more regular basis. This regular re-application is required to manage and maintain weed control.

Council cost estimates of using Organic Interceptor versus glyphosate indicated that the alternative option would cost up to 2.8 times that for glyphosate over a typical year.

Current costs provided by the manufacturer (April 2015) for Bioweed™ are as follows:

- 15 litres: \$150 + GST + freight (\$32.55 incl GST)
- 227 litres: \$1,929.50 + GST + freight
- 942 litres: \$7,520 + GST + freight



Assuming the product was purchased in bulk (i.e. a 942 litre drum) at a total cost of \$8304, one litre would cost approximately \$8.80. On this basis, a 10 litre spraypack would require approximately \$17.50 of product.

Bellingen Shire Council recently completed a pine oil trial using Bioweed™ in response to community concerns about herbicide use. The trial concluded (among other things) that:

Council considers Bioweed in its 'toolbox' of management options for use in controlling weeds where and when appropriate and as budget allows. This may include for maintenance of grass and broad leaf weeds on local roadsides, pathways and reserves in urban township environments.

Bellingen Councils response was based on a combination of matters including the higher cost of the product, the need for more frequent application, greater 'wear and tear' on spray equipment and poorer weed control outcomes than other weed control products. Regarding cost and efficiency, it was noted that a standard maintenance 'run' at a site using glyphosate required 30 litres of mixed product (at a cost of \$2.90) in comparison with Bioweed, which required 180 litres of mixed product at a cost of \$306.00. It was also noted that use of Bioweed for standard park maintenance required fortnightly application in comparison to six-weekly application of glyphosate.

A copy of the Bellingen Shire Council report is attached in full at Appendix M.

5.2.2 Acetic acid

Acetic acid (vinegar) affects the cell membranes of a plant, causing rapid breakdown and desiccation of foliage tissue on contact. When used as a herbicide, acetic acid is substantially more concentrated than household vinegar and has concentrations of 10-20%. Research indicates that 5-10% acetic acid herbicide products can provide viable control of very small, young weeds with only 1-2 leaves (or within 2 weeks of germination). Larger weeds (with >3-4 leaves) are likely to survive treatment; using higher (20%) concentrations of acetic acid and increasing the application volume can improve weed control effectiveness (Smith-Fiola & Gill, 2014).

Benefits of acetic acid include rapid breakdown in the environment and good results in the control of grasses and broad-leaved weeds, with negative aspects being the need for repeat treatments to control regrowth, an unpleasant odour during application and the potential for high irritation to the eyes and skin if contact occurs (Smith-Fiola & Gill, 2014). The product may also be corrosive to metal fittings, hence spraying equipment requires thorough cleaning after use.

Commercially available products in Australia include Beat-a-Weed™ Natural Weedkiller, however this product is designed for home garden use and is not sold in commercial quantities. The product is classified as corrosive and is severely irritating to the respiratory system and skin.

5.2.3 Fulvic acid

Fulvic acid is an inexpensive organic extract from soil humus and is used as a fertiliser product, and as such is not registered under the APVMA. While MSDS classify the product as non-hazardous the product (which occurs as a powder) may cause irritation of the skin and eyes if contact occurs. As the product is derived from soil it is not harmful to the environment.

Fulvic acid is not used as a herbicide directly, but as an adjuvant to increase product efficacy (for example in place of Pulse™ or other adjuvants). The product is also claimed to assist in promoting soil microbe activity. The trial by Bellingen Shire Council (refer Appendix M) used fulvic acid as an adjuvant with glyphosate and MM spray mixes, with results being the same for glyphosate applied



at a 1:50 rate in comparison to application at a 1:75 rate with fulvic acid (i.e. using fulvic acid allowed less glyphosate to be used and at lower concentrations). Bellingen Shire Council concluded that fulvic acid be included in its 'toolbox' of management options to assist in an overall reduction of herbicide use in the Bellingen Shire. An agricultural study in Victoria also concluded that fulvic acid has potential as a cheap adjuvant which assists herbicide absorption (John Stutchberry and Associates, undated).

5.3 Non-herbicide alternatives

5.3.1 Steaming

A number of alternative methods to treat weeds utilise thermal radiation. Steam weeding or 'steaming' is one method employed as a low toxic alternative to the use of chemical herbicides. Steam is generated in a small boiler unit and applied to weeds via a hand held applicator. The steam must reach a temperature over 98° C to breach most plants critical thermal maximum, permeating the cell walls of the plant and causing them to rupture. Several local councils in NSW (Marrickville & Leichardt) have adopted the steam weeding approach in urban areas. Steaming is also suitable for cleaning equipment and facilities in parks and playgrounds (e.g. tables, benches, bins, play equipment).

In 2014 Byron Shire Council conducted a steam weeding trial (Report No. 13.17) in response to community concerns over the use of chemical herbicides in public areas. A contractor was used for the project which completed three weed control events over a six month period at a total cost of \$41,000. The trial was not a pilot program with repeat visits to the same sites and collection of data for comparison, but rather an intermittent response over numerous sites over three occasions.

The trial revealed steam weeding to be effective within urban areas of Byron Shire, particularly for herbaceous annual weeds and exotic grasses growing within garden beds, pavements and gutters within the retail precinct. Limitations steam weeding included low success in treating woody weeds or climbing vines and low weed target ability where turf weeds were difficult to target exclusively amongst desirable surrounding grasses. Steam weeding was determined to be unsuitable for bush regeneration practices. Indirect costs of steam weeding include high usage of diesel and water and creation of exhaust fumes and noise.

Based on the favourable results of the trial it was resolved in Councils meeting of 26 February 2015 that steam weeding be endorsed as a method to supplement other means and replace chemical means for weed eradication near children's playgrounds, public seating, garden beds, urban gutters and other high use areas and also used as a cleaning method on hard surfaces in these areas. Allocation for this resolution has been allowed for in the 2015/2016 budget.

Discussion with the manufacturer (Weedtechnics) indicates steam weeders may be purchased for \$16,000 - \$20,000. However where licensees operate within an area, they have exclusivity to providing steam weeding services, and as such machines are not available for sale. Weedtechnics also point out that the machines are better operated by contractors as operators have completed specific training in the use of the machine, machines require specialised servicing which may be beyond the scope of Council staff, and contractors are better placed to complete early morning works and work long days.

The local contractor for steam weeding currently charges an hourly rate of \$140/hr (+GST) for two operators and \$90/hr (+GST) for one operator. Two operators are recommended for WHS reasons when moving the hose around parks and equipment. Based on an 8 hr day, a typical days steam



weeding would cost \$1120 + GST.

Council has given a commitment that it will investigate further options for the purchase of steam weeding equipment for use by staff. The City of Gold Coast are commencing a steam weeding pilot program in the latter half of 2015.

5.3.2 Slashing

Slashing is completed by Council as part of its standard weed management measures using a tractor, side-arm slasher and brush-cutters. While this is a proven and established weed control method, it is worth investigating whether these methods should be more broadly practiced. Slashing is not a benign practice and has its own issues with regard to diesel usage, noise and traffic management when working in road reserves. Slashing is also costly, time consuming, may be dangerous, requires repeated treatment (as weeds are not killed) and can result in the further spread of weed seed (Navie *et al.*, 2010). This last point is important when considering invasive weeds such as Madeira Vine, where increased environmental costs may result from poor slashing practices.

5.3.3 Manual removal

Manual weed control uses physical effort to remove plants from the ground. This methodology is suitable for small shrubs/saplings and some vines, grasses and herbs. Removal may be completed by hand-pulling or using tools to assist with the removal of plants (e.g. 'crowning' using a boning knife). This methodology is more physically demanding than other techniques and typically requires greater time. The method is unsuitable for larger woody weeds which cannot be physically removed.

A combination of manual removal and 'organic' weed control have been utilised at Mullumbimby Community Gardens. Mature Camphor Laurels were treated by ring-barking (removal of the outer bark layer all around the trunk) with annual follow up treatment to remove regrowth bark and suckers. This method resulted in killing mature Camphor Laurel, and significantly affecting other trees treated (these trees are expected to die shortly).

A midstorey dominated by woody weeds was also removed by manual methods – hand-pulling trees and saplings and using a 'Tree Popper', a tool which levers small trees out of the ground (including the roots). This method has been found to be more efficient than typical 'cut & paint' herbicide methods when conditions are appropriate (e.g. following rain when the soil is softer) (pers comm. Dave Rawlins 30/04/2015). Such methods are suited to dedicated community groups working over small areas where long-term commitment is required. As the process is slow (min. 5-10 years) and is both demanding physically and strategically, large teams are needed to treat large areas of weeds. An information profile of the Mullumbimby Community Gardens works is attached at Appendix G.

Manual removal may also utilise the use of machinery to remove weeds. An example of this is the recent works by Council at Waterlily Park (Ocean Shores), where a contractor has been engaged to remove aquatic weeds using a specialised harvester. The harvester cuts and collects aquatic weeds which are then dewatered and composted on site. When the weed material is broken down it may be used as compost; it is Councils intention to distribute this material to community groups.

As the use of herbicides in aquatic environments should be minimised wherever possible, this methodology provides clear environmental benefits. However impacts include noise, use of fuel and high costs due to the specialised nature of the equipment.



On a simpler scale, manual weed removal in terrestrial areas using machinery such as excavators or a bobcat may be suitable in highly degraded areas with good access and little native vegetation (e.g. large infestations of Lantana). In these instances herbicide use can be significantly reduced as significant primary weed control by foliar spraying is not required. Disadvantages of this method are as above; this method is also unsuitable on steep or floodprone land where soil disturbance or erosion may result.

5.3.4 Planting

Planting out weed dominated areas with native vegetation is a long term approach which aims to restore native ecosystems so they become self-sustaining and suppress weeds by shading or exclusion (displacement). Planting out areas requires a long term strategic view, as weed control is required for an initial establishment period (usually 3-5 years) before vegetation structure is established. While planting is expensive, it has long term gains as it both reduces/eliminates weeds and restores native vegetation and habitat. This approach may be also used as a targeted approach to the management of threatened species habitat, such as restoring Koala habitat.

5.3.5 Vegetation management

Having a flexible approach to intervention and weed control is another management approach. This approach assess existing conditions by recognising the useful role played by existing vegetation where it may be successfully reducing weed cover and or serving other important roles (e.g. stabilising batters or steep slopes). An important aspect of this approach is minimising a reactive response to non-native vegetation by automatically controlling it by herbicide or other means before analysing the role it may be playing in the environment. For example the weedy grass species' Molasses Grass (*Melinis minutiflora*) and Red Natal Grass (*Melinis repens*) form thick swards along batters which bind spoil, reduce erosion and prevent occupation of these environments by other weeds (such as woody weeds like Lantana). Retention of these grassy areas reduces the potential for erosion and uses one weed species to prevent occupation by other less desirable species.

Such an approach needs consideration on a case by case basis and requires analysis of species requirements, their potential for spread and whether environmental values of nearby vegetation may be affected. Where noxious species occur, Council is obligated to control weeds according to requirements.

5.3.6 Fire

Fire is a potential means of controlling weeds as part of integrated forest management and may improve biodiversity outcomes by promoting regeneration and habitat recovery. Because fire can remove significant weed biomass the volume of herbicide needed for weed control following fire is likely to be significantly reduced. Fire has best application in responsive environments (dry sclerophyll forests, heaths) and may be suitable for controlling woody weeds such as Lantana and invasive grasses. Use of fire is best considered in a strategic sense to treat communities at a landscape level to achieve integrated outcomes rather than as a short-term tool to respond to a specific threat. Where a combined approach can be utilised with other stakeholders (OEH, Local Land services), fire management may be worthwhile tool in managing forested areas. However in public open space areas where biodiversity values are generally low and there is need to consider matters of safety, amenity, smoke (etc), fire is an inappropriate method of weed control.

While Council does not currently use fire as a management tool, controlled burns are planned within the clay heath communities at Patterson Hill over the next three years in partnership with the Office of Environment and Heritage (OEH). These works will be combined with weed control and



stem injection of woodland species encroaching on core areas of clay heath. An indirect result of the works may also be the reduction of bushfire risks to adjacent residents.

Between 2015 - 2016 the Nature Conservation Council of NSW will be preparing a state-wide review of fire and weeds with a number of regionally specific case studies. This study may have implications for future weed management methods within Byron Shire.

5.3.7 Biological control

Biological control for a number of weed species have been developed and promoted by Far North Coast Weeds for species including Lantana, Madeira Vine, Salvinia (*Salvinia molesta*), Cat's Claw Creeper (*Dolichandra unguis-cati*) and Giant Parramatta Grass (*Sporobolus fertilis*). While Council is not actively engaged with biological control methods, FNCW have released weevils for control of Salvinia at Waterlily Park (Ocean Shores) in 2014. Further monitoring will reveal the success of this action and whether a weevil population establishes and persists.

Discussion with Tweed Council representatives indicates biological control methods have application as part of integrated weed management:

- Salvinia control: weevil control and establishment of beetle populations has been successful at many sites in the Tweed.
- Cat's Claw Creeper: agents have been released and established, however monitoring has not determined established populations as yet. Further monitoring (supported by funding) is required.
- Giant Parramatta Grass: infested material has been established in roadside reserves and on private land with some success.

Adoption of biological control methods by Council would be based on a case by case basis in partnership with Far North Coast Weeds.

5.4 Discussion

Based on this information, it appears there are relatively few alternative methods for weed control which are proven and/or commercially available, particularly for woody weeds. Another observation is that all weed control methods have negative aspects, such as noise, other requirements (diesel, water) or risks to health (operator/public) and or the environment. A matrix assessing weed control methods in urban areas developed by Winer (2014) provides a good snapshot of some of the issues which require consideration when comparing different products, and is shown at Table 5.1). It should be noted that some methods have not been trialed locally, nor are they practiced broadly within Australia (e.g. weed brushing).

Table 5.2 provides a summary of Councils current weed control methods and alternative methods, with a ranking allocated to the cost, effectiveness and risk of each method. Detailed costings for comparison have not been completed, although as a measure, a 'typical' 10 litre spraypack of glyphosate mixture is estimated as including approximately \$2 worth of product (inclusive of surfactants and dyes). During the consultation processes some comparisons with alternative methods were pointed out by Council staff as follows [Note: this information has not been comprehensively costed or trialed and costs stated are indicative only]:

- Weed control in playgrounds is estimated to cost \$3500 annually using glyphosate, in contrast to the cost of \$41, 000 for steam weeding (based on the trial completed). However



it should be noted that the steam weeding trial was not comprehensive and data was not collected to allow direct financial comparisons to be extrapolated out over a typical year.

- The sustainability factors of steam weeding should be taken into consideration (e.g. 4 litres of diesel, 2.5 litres of unleaded fuel and 300l of water are used per hour).
- Spraying vs hand weeding – reverting to hand-weeding may result in an approximate 8-fold increase in labour.

Using contractors with shrouded booms for roadside spraying works may increase expenses by up to three times.

BYRON SHIRE COUNCIL

STAFF REPORTS - INFRASTRUCTURE SERVICES

5.1 - ATTACHMENT 1

DRAFT Byron Integrated Weed Management Strategy

Table 5.1 Weed control assessment matrix (derived from Winer, 2014)

Consideration		Chemical spray				Chemical – wick, cut & paint	Mechanical			Steam Weeding
		Glyphosate based	Vinegar	Citric acid	Pine oil	Glyphosate	Weed brush	Whipper- snip	Hand tools	
Application	Contact	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Systemic	Y				Y				
	Pre-emergent	Y								Potentially
Effect	Above ground	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Meristematic crown	Y	Y	Y	Y	Y			Y	Y
	Roots	Y				Y			Y	
	Seed bank						May spread	May spread		HIGH
Efficacy	(overall)	HIGH	MOD	MOD	VARIABLE	HIGH	LOW	LOW	HIGH	Y
Surface type	Paved	Y	Y #	Y	Y	Y	Y ##	Y	Y	Y
	Gravel	Y	Y	Y	Y	Y		Y	Y	Y
	Mulched	Y	Y	Y	Y	Y		Y	Y	Y
	Turfed		Spot spray	Spot spray	Spot spray	Some weeds		Y	Y	Y
	Rubberised	Y	Y	Y	Y	Y		Y ##	Y	Y
Location suitability	Footpaths	Y	Y	Y	Y	Y		Y	Y	Y
	Kerb/gutter	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Playgrounds	N	Y	Y	Y	?		Y	Y	Y
	Street trees	?	Y	Y	Y	?		Y	Y	Y
	Pedestrian areas	?	Y	Y	Y	?	Y	Y	Y	Y
	Creeklines	?	Y	Y	Y	Y		Y	Y	Y
	Ephemeral areas	?	?	?	?	?		Y	Y	Y
Frequency	(per annum SE Aust)	4-8	8-12	8-12	8-12	5-8	10-24	20-26	6-8	6-8
Noise	Nuisance rating	Nil - low	Nil	Nil	Nil	Nil	High	High	Nil	Moderate
Accessibility	Very Good, Good, Poor	VG	VG	VG	VG	GOOD	POOR	VG	VG	GOOD
CO2 emissions	Kg/annum/Ha	151*	151*	151*	151*	Nil				115 (truck & machine)
Water use	Low, Med, High	LOW	LOW	LOW	LOW	LOW	Nil	Nil	Nil	HIGH (300 litres/hr)
Human harm potential	Poisoning - operator	HIGH	MOD	MOD	MOD	HIGH	Nil	Nil	Nil	NIL
	Poisoning - public	MOD	LOW	LOW	LOW	LOW	Nil	Nil	Nil	NIL
	Physical - operator	LOW	LOW	LOW	LOW	LOW	LOW	MOD	MOD	MOD
	Physical - public	LOW	LOW	LOW	LOW	LOW	LOW	MOD	Nil	LOW
Environmental	Off target species	HIGH	LOW	LOW	LOW	LOW	Nil	LOW	LOW	LOW



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DRAFT Byron Integrated Weed Management Strategy

Consideration		Chemical spray				Chemical – wick, cut & paint	Mechanical			Steam Weeding
		Glyphosate based	Vinegar	Citric acid	Pine oil	Glyphosate	Weed brush	Whipper- snip	Hand tools	
harm potential	Residual	HIGH	LOW	LOW	LOW	LOW	Nil	Nil	Nil	NIL
	Stormwater pollution	HIGH	LOW	LOW	?	LOW	Nil	Nil	Nil	NIL
	Bio-accumulation	HIGH	LOW	LOW	LOW	LOW	Nil	Nil	Nil	NIL
	Fauna	HIGH	LOW	LOW	LOW	LOW	Nil	LOW	LOW	LOW
Public notification requirements		YES	Possibly	Possibly	Possibly	YES	NO	NO	NO	NO
Economic efficiency	Low, Med, High cost	LOW	MED	MED	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

may discolour

reduces surface life

*Excludes pump & carrier



Table 5.2 Summary of existing and alternative weed control methods

Weed Control Method	Cost	Effectiveness	Environmental risk
Chemical			
Glyphosate, Metsulfuron Methyl, Selective Turf Herbicides	Low	High	<ul style="list-style-type: none"> Hazard to applicator Hazard to community Environmental harm due to off target application
Alternative herbicides/adjuvants			
Pine oil	High	Low – Moderate	<ul style="list-style-type: none"> Hazard to applicator Higher application rates Wear and tear on spray equipment
Acetic acid (vinegar)	Low	Low – Moderate	<ul style="list-style-type: none"> Highly acidic Unpleasant smell Corrosive to fittings
Fulvic acid	Low	High (adjuvant only)	<ul style="list-style-type: none"> None (increases efficiency of herbicides to which it is added)
Non-chemical			
Slashing (tractor/side-arm)	High	High	<ul style="list-style-type: none"> Slow and laborious Requires additional staff /resources for traffic control Can spread weeds if machine hygiene is not practiced
Machine hygiene	Low-Moderate	High	<ul style="list-style-type: none"> Extra training/resources/time Requires specific wash-down facilities Difficult to service the entire shire
Steaming	High	Low - Moderate	<ul style="list-style-type: none"> Can be slow Utilises fuel (diesel) and water Spray units may be noisy Quality of use depends on operator training (e.g. discriminating between weeds)
Manual control (human)	Moderate - High	Moderate	<ul style="list-style-type: none"> Slow and laborious Physically demanding Unsuitable for large areas Requires long-term commitment
Manual control (machinery)	High	High	<ul style="list-style-type: none"> Typically noisy Generates exhaust Safety hazards when in public areas Potential for erosion and soil disturbance Can spread weeds if machine hygiene is not practiced
Planting	High	Moderate - High	<ul style="list-style-type: none"> Requires long-term commitment Not suitable for large areas



DRAFT Byron Integrated Weed Management Strategy

Weed Control Method	Cost	Effectiveness	Environmental risk
Fire	High	Moderate	<ul style="list-style-type: none"> • Integrated planning required • Long-term management may be required • Associated risks and hazards (wildfire escape, smoke, aesthetics)
Biological control	Low	Low - Moderate	<ul style="list-style-type: none"> • Species specific • May be slow to establish • May be funding dependent



6 Evaluation and recommendations

Based on the information in the previous sections, it appears evident that chemical herbicides have some clear advantages in that they are low cost, efficient and easily deployed, while some alternative methods have potential for application in the shire in specific situations (steam weeding, pine oil). While the environmental impacts of chemical herbicides are often debated (and could occupy numerous discussion papers alone), the potential impacts to the environment (inclusive of the public) may be relatively modest, provided best practice management occurs. Regardless, Council has an obligation to protect the health of the public and the environment, while balancing the need to provide facilities of high quality and manage bushland areas (including areas of high conservation value).

Based on the review, it is concluded that:

- Council meets its statutory requirements with regard to having a *Pesticide Use Notification Plan* and providing a registration option for chemically sensitive residents and organic growers. Based on review, some amendments to the PUNP are required, as summarised at Table 6.1.
- Council uses a range of weed management techniques in an integrated manner to maintain various land types within the Shire, including a range of high use public areas.
- Glyphosate and Metsulfuron-methyl are effective, low cost herbicides which (when used appropriately and in accordance with the PUNP) and are likely to have relatively low impacts on the environment. Further, both products are suitable to manage a range of weeds from grasses and herbs to vines and woody weeds, and hence are suited to environmental works where a flexible approach to weed management is required.
- A range of selective herbicides are used for managing playing fields and parks, where glyphosate/MM are not suitable. These products are typically of higher toxicity, with MSMA being of very high toxicity. While the range of selective herbicides utilised by Council/contractors is part of the overall 'toolkit' for maintaining these facilities to a high standard, use of a Schedule 7 herbicide (MSMA) is of concern and alternative products should be used.
- Specialist management is required for playing fields where selective herbicides are required to maintain playing surfaces and where no practical alternatives exist. On this basis chemical based herbicides will continue to be used in these areas, but with a focus on minimising use, using lowest toxicity products and trialling any new and emerging products of low toxicity.
- Based on the review of alternative weed control techniques, steam weeding and pine oil have potential for use in specific situations and their use should be adopted within high use public areas.

Note: While the above approach takes steps to address Resolution 13-621 and reduce herbicide use, it must be noted that circumstances of weed control will vary over time in response to conditions. Where unusual circumstances occur and weed control within a high use public area cannot be achieved under the strategies above, there will be a need to use chemical based herbicides (including herbicides of moderate to high toxicity). This flexible



approach is necessary for Council to maintain open space, utilities and assets to an expected standard and not be limited by any restrictions prescribed in the Strategy.

An example of this approach might be where a park becomes infested with Bindii to such a degree that a no/low herbicide approach is no longer effective. To ensure the park is maintained to a high standard, Council may complete weed control works using another product under exceptional circumstances to return the park to a satisfactory condition.

Table 6.1 Recommended amendments to the PUNP (2007)

Item	Recommendation
Treatment of road verges: Currently no prior notification is required as this is a regular, ongoing practice.	Notification is provided for road verges and better planning of roadside work is completed to facilitate this. A map on Councils website with updates would be helpful in flagging works as it is understood roadside works are a concern of some residents. Rationale: public are better informed and notified of works.
Information provision: Currently information on each product is provided with regard to each action.	General information is provided on the range of pesticides used, why they are used, how they are used and the poison schedule of each product. This could be included in an appendix to the PUNP (and updated as required) or placed on Councils website. Rationale: public are better informed of herbicide usage.
General	Wherever moderate high toxicity selective herbicides are used in high use public areas, an exclusion period is applied based on the product used and fencing/signage is erected following treatment and removed after the exclusion period. Rationale: To increase public awareness when more toxic selective herbicides are applied so they can make decisions to avoid areas of treatment if they choose. Clarification of notification requirements for those on the chemical sensitive register. Rationale: to provide registered people with clear guidance on procedures.

Based on the information review, it is worthwhile examining several scenarios for future weed control in the Shire in consideration of Resolution 13-621, for example:

1. Do nothing: maintain current practices with little regard for the Resolution given it is an 'aspiration' to reduce chemical user.
2. Refine current methodologies to seek to address Resolution 13-621,
3. Refine current methodologies to seek to address Resolution 13-621, including the adoption of new methods/technologies.
4. Adopt Resolution 13-621 wholly and cease all chemical herbicide use in high-use public areas
5. Expand Resolution 13-621 to cease all chemical herbicide use within the Shire

This range of scenarios is a reasonable representation of the spectrum of community desires and is examined at Table 6.2 with regard to the outcomes of adopting these strategies.

Table 6.2 Summary of potential future weed management scenarios

Scenario	Likely outcomes
1. Do nothing	No change to current practices and no reduction in herbicide use would occur. Clearly this approach is contrary to Resolution 13-621 and is not acceptable.
2. Refine current methodologies to seek to address Resolution 13-621	Reduced herbicide use and improved performance ('best practice'). Acceptance that a range of weed management techniques is required specific to different situations (e.g. weed control in areas of high biodiversity VS control of turf weeds on playing fields). Councils existing weed management responsibilities would be largely unchanged; some additional staff training and resources required.
3. Refine current methodologies to seek to address Resolution 13-621, including the adoption of new methods/technologies	As above, but using new technologies such as alternative herbicides (e.g. pine oil) or practices (e.g. steam weeding). Adaptive management to reduce herbicide use in high use public areas. Councils existing weed management responsibilities would change to manage this new approach. New training and responsibilities would be required for use of new technologies; increased costs would result., additional contracting may be required.
4. Adopt Resolution 13-621 wholly and cease all chemical herbicide use in high-use public areas	Chemical herbicide in high use public areas ceases and efforts are made to reduce herbicide use in other public areas. Councils existing weed management responsibilities would be substantially changed. New training and approaches would be required for high use public areas and increased costs would result. Works in other areas would require change in practices (training, equipment etc.).
5. Expand Resolution 13-621 to cease all chemical herbicide use within the Shire	Chemical herbicide use is prohibited within the Shire within all land managed by Council. Councils existing weed management responsibilities would be significantly changed. Managing weeds on roadsides, open space and bushland areas would require increased budget and staffing. Management of environmental areas would require substantial additional resources. Biodiversity values may decline over time within environmental reserves; assets in road reserves and public areas may have reduced longevity and require greater maintenance; the quality of parks and playing fields would be likely to decline.

Based on these potential outcomes and in consideration of the review process, the Strategy has adopted Scenario 3 as the best means of addressing Resolution 13-621 and delivering good outcomes for the public, the environment and Council. This 'middle ground' approach has informed the actions proposed in Section 2 of the Strategy.

7 References

Adair, R. J., Bradstock, R. A., Auld, T. D., Keith, D. A., Kingsford, R. T., Lunney, D. & Sivertsen, D. P. (1995) The threat of environmental weeds to biodiversity in Australia: a search for solutions. In *Conserving biodiversity: threats and solutions*. (pp. 184-201). Surrey Beatty & Sons Pty. Ltd.

Australian Weeds Strategy, (2006) A national strategy for weed management in Australia. Natural Resource Management Ministerial Council, Australian Government Department of the Environment and Water Resources, Canberra ACT.

Australian Pesticides and Veterinary Medicines Authority (APVMA), (2011) Halosulfuron-methyl in the product Semptra Herbicide by Monsanto. Website: <http://apvma.gov.au/node/13806> (accessed 15th April, 2015).

Baker, H.G., (1974). The Evolution of Weeds. *Annual Review of Ecology and Systematics* 5, 1-24 University of California, Berkeley, California US

Batianoff, G. N., & Butler, D.W. (2003) Impact assessment and analysis of sixty-six priority invasive weeds in south-east Queensland. *Plant Protection Quarterly* 18.1 (2003): 11-15.

Big Scrub Rainforest Landcare Group (BSRLG) (2005). *Subtropical Rainforest Restoration. Second Edition*. Bangalow, NSW.

Bundesinstitut für Risikobewertung (BfR) (2015) *Does glyphosate cause cancer?* BfR Communication No 007/2015, 23 March 2015.

Bush Futures, (2010). Tweed Byron Bushland Audit: *Improving Urban and Peri-urban Bushland Sustainability in Tweed and Byron Shires*. Tweed Heads, NSW.

Byron Shire Council (2004) *Byron Shire Biodiversity Conservation Strategy*. Byron Shire Council, Mullumbimby, NSW

Byron Shire Council (2010) *Byron Shire Bush Regeneration Guidelines*. Byron Shire Council, Mullumbimby, NSW

Byron Shire Council (2012) *Draft Byron Shire Council Community Strategic Plan*. Byron Shire Council, Mullumbimby, NSW

Chemcert (2012) *Chemcert Training Manual*. Chemcert, Bondi Junction NSW.

Coutts-Smith, A.J., & Downey, P.O. (2006) *Impact of weeds on threatened biodiversity in New South Wales*. Technical Series no. 11, CRC for Australian Weed Management, Adelaide.

Day, C., Petroeschovsky, A., Pellow, B., Bevan, J., O'Dwyer, T., St Lawrence, A., & Smith, G. (2014) Managing a priority outlier infestation of *Cabomba caroliniana* in a natural wetland in the Blue Mountains, NSW, Australia: could this be eradication? In *Draft paper to 19th Australasian Weeds Conference, Hobart, Australia*.



DEC (Department of Environment and Conservation) (2006) *NSW Threat Abatement Plan – Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)*. Department of Environment and Conservation (NSW), Hurstville.

Federal Institute for Risk Assessment (BfR), (2015) Does Glyphosate Cause Cancer? website: <http://www.bfr.bund.de/cm/349/does-glyphosate-cause-cancer.pdf> (Accessed 15th April 2015).

French, K., & Buckley, S. (2008) The effects of the herbicide metsulfuron-methyl on litter invertebrate communities in a coastal dune invaded by *Chrysanthemoides monilifera* spp. *rotundata*. *Weed research*, 48(3), 266-272.

Gallagher, R. V., & Leishman, M. R. (2014) Invasive plants and invaded ecosystems in Australia: implications for biodiversity. *Austral Ark*, 105.

Geolink, (2012) *Roadside Vegetation Management Plan*. Report prepared for Byron Shire Council, Mullumbimby, NSW.

IUCN (the World Conservation Union) (2000) *IUCN guidelines for the prevention of biodiversity loss caused by alien invasive species*. Species Survival Commission, website: <http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm>

International Agency for Research on Cancer (IARC) (1986) Some halogenated hydrocarbons and pesticide exposures. Lyon, 1986:357-407 (IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Volume 41).

John Stutchberry and Associates (undated) *Southern Agribusiness Trial Extension Network Summer Weed Control*. Final report to Grains Research and Development Corporation.

Lindsay, E. A., & French, K. (2005) Litterfall and nitrogen cycling following invasion by *Chrysanthemoides monilifera* ssp. *rotundata* in coastal Australia. *Journal of Applied Ecology*, 42(3), 556-566.

Lajmanovich, R.C, Junges, C.M, Attademo, A.M., Peltzer, P.M., Cabagna-Zenklusen, M.C. & Basso, A. (2013) Individual and Mixture Toxicity of Commercial Formulations Containing Glyphosate, Metsulfuron-Methyl, Bispyribac-Sodium, and Picloram on *Rhinella arenarum* Tadpoles. *Water Air Soil Pollution* 224:1404.

Lindsay, E. A., & French, K. (2004) The impact of the herbicide glyphosate on leaf litter invertebrates within Bitou bush, *Chrysanthemoides monilifera* ssp *rotundata*, infestations. *Pest management science*, 60(12), 1205-1212.

Lonsdale, W.M. & Lane, A. M (1994) Tourist vehicles as vectors of weed seeds in Kakadu National Park, Northern Australia. *Biological Conservation* 69.3 (1994): 277-283.

Mann, R. M., & Bidwell, J. R. (1999). The toxicity of glyphosate and several glyphosate formulations to four species of southwestern Australian frogs. *Archives of environmental contamination and toxicology*, 34(2), 193-199.

Millennium Ecosystem Report (2005) *Ecosystems and human well-being*. Vol. 5. Washington, DC: Island Press, 2005.



Mink, P. J., Mandel, J. S., Lundin, J. I., & Scurman, B. K. (2011) Epidemiologic studies of glyphosate and non-cancer health outcomes: a review. *Regulatory Toxicology and Pharmacology*, 61(2), 172-184.

Mink, P. J., Mandel, J. S., Scurman, B. K., & Lundin, J. I. (2012) Epidemiologic studies of glyphosate and cancer: a review. *Regulatory Toxicology and Pharmacology*, 63(3), 440-452.

Nakamura, A., Catterall, C. P., Kitching, R. L., House, A. P., & Burwell, C. J. (2008) Effects of glyphosate herbicide on soil and litter macro-arthropods in rainforest: Implications for forest restoration. *Ecological Management & Restoration*, 9(2), 126-133.

Navie, S. C., Hampton, S. J., Bloor, N., & Zydenbos, S. M. (2010) Integrated management of mown vegetation in eastern Australia. In *17th Australasian weeds conference. New frontiers in New Zealand: together we can beat the weeds. Christchurch, New Zealand* (pp. 26-30).

Oakwood, M. (2009). Northern Rivers Invasive Plants Action Strategy 2009-2013.

Parkes, T., Delaney, M., Dunphy, M., Woodford, R., Bower, H., Bower, S., & McDonald, T. (2012). Big Scrub: A cleared landscape in transition back to forest? *Ecological Management & Restoration*, 13(3), 212-223.

Prukop, J. A., & Savage, N. L. (1986). Some effects of multiple, sublethal doses of monosodium methanearsonate (MSMA) herbicide on hematology, growth, and reproduction of laboratory mice. *Bulletin of environmental contamination and toxicology*, 36(1), 337-341.

Radivojević, L., Jovičić, J. D., Šantrić, L., Gašić, S., & Gajić, J. U. (2014) Effects of Metsulfuron Methyl on soil microbial activity. *Архив за техничке науке*, 1(11), 77-82.

Ratcliff, A. W., Busse, M. D., & Shestak, C. J. (2006) Changes in microbial community structure following herbicide (glyphosate) additions to forest soils. *Applied Soil Ecology*, 34(2), 114-124.

Sakai, A. K., Allendorf, F. W., Holt, J. S., Lodge, D. M., Molofsky, J., With, K. A., & Weller, S. G. (2001) The population biology of invasive species. *Annual Review of Ecology and Systematics*, 305-332.

Sinden, J., Jones, R., Hester, S., Odom, D., Kalisch, C., James, R., & Griffith, G. (2004) *The economic impact of weeds in Australia*. Technical Series, 8.

Sinden, J. A. & Griffith, G. "Combining economic and ecological arguments to value the environmental gains from control of 35 weeds in Australia." *Ecological Economics* 61.2 (2007): 396-408.

Sistox Assessment Services (2014) *A review of the earth open source (eos) report "Roundup and birth defects: Is the public being kept in the dark?"* Report prepared for the Australian Pesticide and Veterinary Medicines Authority (APVMA), Canberra, ACT

Smith-Fiola & Gill, (2014) *Vinegar: An alternative to Glyphosate?* University of Maryland, College Park, Maryland, USA 1-6.

Spencer, H. J. (2012) Metsulfuron-methyl impact on native vegetation in the Daintree lowlands, far-north Queensland, Australia. In *Developing solutions to evolving weed problems. 18th Australasian Weeds Conference, Melbourne, Victoria, Australia* (pp. 8-11).

Ünal, F., Yüzbaşıoğlu, D., Yılmaz, S., Akinci, N., & Aksoy, H. (2011) Genotoxic effects of chlorophenoxy herbicide diclofop-methyl in mice in vivo and in human lymphocytes in vitro. *Drug*



and chemical toxicology, 34(4), 390-395.

van Klinken, Rieks D., (2014) "Learning from the past to predict the future: an historical analysis of grass invasions in northern Australia." *Biological Invasions* (2014): 1-15.

Wendt-Rasch, L., Pirzadeh, P., & Woin, P. (2003) Effects of metsulfuron methyl and cypermethrin exposure on freshwater model ecosystems. *Aquatic toxicology*, 63(3), 243-256.

Williams, J. A. & West, C. J. (2000) Environmental weeds in Australia and New Zealand: issues and approaches to management. *Austral Ecology*, 25: 425-444.

Williams, A. L., Watson, R. E., & DeSesso, J. M. (2012) Developmental and reproductive outcomes in humans and animals after glyphosate exposure: a critical analysis. *Journal of Toxicology and Environmental Health, Part B*, 15(1), 39-96.

Williamson, M., & Fittler, A., (1996) The varying success of invaders. *Ecology* 77: 1661 – 1666.

Zavaleta, E., Hobbs, R., Mooney, H. (2001) Viewing invasive species removal in a whole ecosystem context. *Trends in Ecology and Evolution* 16: 454-459.



Appendix A – Pesticide Use Notification Plan 2007



AWC

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**Byron Shire Council
PESTICIDE USE NOTIFICATION PLAN**

March 2007

#655755

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March 2007

Byron Shire Council PESTICIDE USE NOTIFICATION PLAN

1. INTRODUCTION

This Pesticide Use Notification Plan has been prepared in accordance with the requirements of the Pesticides Regulation 1995 (the Regulation). The Plan sets out how Byron Shire Council will notify members of the community of pesticide applications it makes, or allows to be made, to public places that it owns or controls.

Pesticides include a range of substances used to destroy, suppress or alter the life cycle of any pest. These can include herbicides, insecticides, bactericides, fungicides, rodenticides, baits and lures. The NSW Department of Environment and Conservation provides more detail in the fact sheet "What are Pesticides?", which can be sourced at www.environment.nsw.gov.au/pesticides.

Byron Shire Council is aware that some members of the community may wish to avoid contact with pesticides. In particular, Council aims to minimise pesticide application in the vicinity of properties listed on the Chemically Sensitive Register.

Council staff, or contractors, undertaking spraying will be required to possess a current 'Sensitive Persons' and 'Organic Growers' Register and conduct spraying with regard to these Registers.

2. PUBLIC PLACES COVERED BY THIS PLAN

Byron Shire Council proposes to use or allow the use of pesticides in the following categories of outdoor public places that it owns or controls in Byron Shire:

- parks and garden beds
- playgrounds
- picnic tables and park shelters
- caravan parks
- road verges, road reserves, laneways, pathways and easements accessible to the public
- sporting fields and ovals, golf course
- cricket wickets
- swimming pools
- rivers and foreshores, excluding natural areas
- coastal dunes, natural areas, bushland, natural wetlands, vegetated rivers and foreshores
- drains, drainage systems and constructed wetlands
- Myocum landfill
- cemeteries

This Notification Plan will also provide information on how notice will be provided to the community of pesticide use in the following facilities that are owned or managed by Byron Shire Council:

- buildings such as libraries and community centres
- sewage treatment plants, constructed wetlands and effluent reuse areas, Laverly's Gap water treatment plant

Byron Shire Council's estimate of the level of community use, regular user groups and types of pesticide use in each of these categories of public places is summarised in the following table.

Public Places	Regular User Groups	Level of Use	Type pf Pesticide Use
Parks and garden beds	general recreational users eg picnickers and joggers all ages and social groups	Use varies significantly from very high to low	<ul style="list-style-type: none"> • spot application of selective and non selective herbicides • spot application of insecticides - eg ants or wasp nests • directed application of non selective herbicide • broadscale application of selective herbicide • rodenticide– irregular treatment, as required
Playgrounds	• children and other family members	High	<ul style="list-style-type: none"> • spot application of non selective herbicides – limited use only • spot application of insecticides - eg ants or wasp nests
Picnic tables and park shelters	• general community	Moderate	<ul style="list-style-type: none"> • occasional spot insecticide - eg ants or wasp nests
Sporting fields and ovals, golf course (excluding turf cricket wickets)	<ul style="list-style-type: none"> • children • general sports participants • informal use by all ages 	High	<ul style="list-style-type: none"> • spot application of selective and non selective herbicides • spot application of insecticides - eg ants or wasp nests • broadscale application of selective herbicide • rodenticide– irregular treatment, as required
Cricket wickets	<ul style="list-style-type: none"> • cricket players • informal use , generally children 	Varies from intensive (match days) to low	<ul style="list-style-type: none"> • spot application of selective herbicides • spot applications of fungicides • spot application of insecticides - eg ants

BYRON SHIRE COUNCIL

STAFF REPORTS - INFRASTRUCTURE SERVICES

5.1 - ATTACHMENT 1

Public Places	Regular User Groups	Level of Use	Type of Pesticide Use
Swimming pools	<ul style="list-style-type: none"> • children • general community • formal and informal training (all ages) 	High (seasonal)	<ul style="list-style-type: none"> • spot application of selective and non selective herbicides • spot application of insecticides - eg ants or wasp nests • broadscale application of selective herbicide
Rivers and foreshores (excluding natural areas and bushland)	<ul style="list-style-type: none"> • fishing, swimming, boating access and walking 	Low (high use in parks adjoining foreshore)	<ul style="list-style-type: none"> • spot application of non selective herbicide • rodenticide – regular treatment, or as required
Coastal dunes, natural areas and bushland, natural wetlands and vegetated rivers and foreshores	<ul style="list-style-type: none"> • general beach users • Landcare and Dunecare groups • informal bushwalking 	Low, other than adjacent to facilities, paths or trails.	<ul style="list-style-type: none"> • spot application of non selective herbicides • directed application of non selective herbicide • stem injection of herbicide • cut scrape paint herbicides • stem injection of insecticide – pandanus planthopper • rodenticide– irregular treatment, as required
Drains and drainage systems and constructed wetlands	<ul style="list-style-type: none"> • no regular users • nature observation 	Low	<ul style="list-style-type: none"> • spot application of non selective herbicide • directed application of non selective herbicide • broadscale application of non selective herbicide (water weeds) • rodenticide– irregular treatment, as required
Caravan Parks	<ul style="list-style-type: none"> • families • small groups of all ages • permanent residents 	Moderate, seasonally dependant	<ul style="list-style-type: none"> • spot application of non selective herbicide • spot application of insecticides - eg ants or wasp nests • broadscale application of selective herbicide • rodenticide– irregular treatment, as required
Myocum Landfill (public areas only)	<ul style="list-style-type: none"> • general community 	Low to moderate	<ul style="list-style-type: none"> • spot application of non selective herbicide • directed application of non selective herbicide • rodenticide– irregular treatment, as required

Public Places	Regular User Groups	Level of Use	Type of Pesticide Use
Road verges, road reserves, laneways and pathways	<ul style="list-style-type: none"> all sections of community using footpaths 	Low in rural areas, moderate to high in urban areas	<ul style="list-style-type: none"> spot application of non selective herbicide directed application of non selective herbicide spot application of insecticide - eg wasp nest broadscale application of non-selective herbicides
Cemeteries	<ul style="list-style-type: none"> general community 	Low	<ul style="list-style-type: none"> spot application of selective and non selective herbicides spot application of insecticides - eg ants or wasp nests fungicide (garden beds) rodenticide- irregular treatment, as required
Buildings owned or managed by Byron Shire Council	<ul style="list-style-type: none"> general community 	Moderate to high	<ul style="list-style-type: none"> rodenticide- irregular treatment, as required scheduled inspections – spot application of insecticides, as required
Sewage treatment plants and effluent reuse areas	<ul style="list-style-type: none"> no regular users nature observation 	Low	<ul style="list-style-type: none"> spot application of non selective herbicides directed application of non selective herbicide rodenticide- irregular treatment, as required

3. NOTIFICATION ARRANGEMENTS

This section describes how and when Byron Shire Council will provide notice of pesticide use in public places, including special measures for sensitive places that are adjacent to public places, arrangements for emergency pesticide applications and circumstances where notice will not be given.

These notification requirements are based on Byron Shire Council's assessment of:

- the type of pesticide used
- the level of use of public places where pesticides may be used
- the extent to which members of the public most likely to be sensitive to pesticides (eg young children, sick, elderly) are likely to use these areas
- the extent to which activities generally undertaken in the areas could lead to some direct contact with pesticides (eg picnic areas, sporting fields)

Notice of pesticide use may be provided by a combination of:

- signs
- Council website
- notification in Council's block advertising

- letters, facsimile or emails
- personal contact through telephones or doorknocking

How and When Notice of Pesticide Use Will Be Provided

Generally, notice of pesticide use will be provided in the ways described below. Specific arrangements for various categories of public open space are also listed.

1. For spot and directed applications of pesticide during regular maintenance, no prior notification will be provided. Notification is provided through this Plan, and a statement on Council's website.

Spot application of pesticides is using a backpack or hand held applicator (eg spray can) delivering a low volume in a restricted area. Examples include control of grass around infrastructure such as signs, footpaths, rock walls and garden beds, and control of insect nests such as wasps. This may be part of a regular maintenance program, or unplanned reactive situations.

Directed application of pesticides is using a mechanical pump and hand held or automated nozzle delivering single sprays, generally in a linear pattern and targeting individual or small groups of weeds. Examples are spraying kerbs, gutters and median strips, or steep slopes and other difficult to access areas.
2. Council's website will provide prior notice of scheduled broadscale pesticide applications.

Broadscale application of pesticides is considered to involve boom sprays and other methods delivering high volumes over a wide area.
3. Specific notification arrangements are in place for different categories of public land as described below. These are based on factors such as the pesticide being applied, the method of application and the nature and frequency of use by members of the public. For example, drains and bushland have a much lower public use than managed parks. In managed parks, access to garden beds is much less than on mown grass areas.
4. Notification arrangements are in place for sensitive areas, as defined by the *Pesticide Regulations (1995)*. Refer to 'Special arrangements for sensitive places' below.
5. From time to time Council may be required to undertake pest control in unexpected places not covered by this Plan. In these instances, notification needs will be assessed according to the pesticide used, application method and level of use of that area. Examples can include:
 - termite nests on public land can require treatment if private or public infrastructure is threatened. This is rare, but may occur on any category of public land
 - feral animal control (eg rabbits) is very rare, but may be required in extreme cases
6. Pesticide applications are dependant on suitable weather conditions. Where prior notification is provided, weather conditions can influence the proposed dates.

Parks and Garden Beds

For parks and garden beds, notification procedures for the following pesticides uses will apply:

- Bindii and broad leaf weeds (broadscale selective herbicide). Applications are scheduled and the following notification procedures will apply:
 - notification in Council's block advertising
 - temporary signs displayed during application

- Directed application of non-selective herbicide is occasionally undertaken in very low use areas that can't be mown (eg steep or inaccessible places).
 - Council website
 - signs placed at access points, roads etc, on the day of application

- control of insects in garden beds (spot application selective insecticide)
 - notification according to spot application requirements (see page 5 of this plan)

- insect control (broadscale application)
 - notification in Council's block advertising
 - temporary signs displayed during application

- Pandanus trees can become infected with a planthopper insect. Infected trees are treated by stem injection using a systemic insecticide, with occasional restricted foliar application
 - no prior notification will be provided as this is a reactive treatment applied when trees are infected
 - for foliar applications only, operator remains on site until the product dries
 - signs placed at access points on the day of application
 - staff on ground managing public access to area

Playgrounds

Playgrounds are high use areas favoured by young children. Council aims to minimise pesticide use around playgrounds by using manual weed control methods (brush cutting, hand pulling) where possible.

Where required, Council will continue to undertake spot applications of pesticides as described below. As these are all very small doses in limited areas, no special notification procedures are proposed.

Notification for the following applications will be according to spot application requirements (see page 5 of this Plan).

- Bindii control through spot application of a selective herbicide. Minor infestations in small areas are treated as required.
- ant control is occasionally undertaken through spot application of an insecticide. Infestations in small areas are treated as required.
- insect nests (eg wasps) are treated through spot application of an insecticide

Picnic Tables and Park Shelters

Picnic tables and park shelters are high use areas often associated with food consumption. Council aims to minimise pesticide use around picnic tables and shelters by using manual weed control methods (brush cutting, hand pulling) where possible.

Where required, Council will continue to undertake spot applications of pesticides as described below. As these are all very small doses in limited areas, notification will be according to spot application requirements (see page 5 of this Plan).

- Bindii control through spot application of a selective herbicide. Minor infestations in small areas are treated as required.
- ant control is occasionally undertaken through spot application of an insecticide. Infestations in small areas are treated as required.
- Insect nests (eg wasps) are treated through spot application of an insecticide

Sports Fields and Golf Course (Excluding Turf Cricket Wickets)

For sporting fields and ovals, notification procedures for the following pesticides uses will apply:

- Bindii and broad leaf weeds (broadscale selective herbicide). Applications are scheduled and notification procedures will include:
 - notification in Council's block advertising and Council website
 - temporary signs will be displayed during application and remain in place until the product dries (generally around one hour)
 - contact with sports clubs licensed to use the field
- insect control (including ants, lawn grubs, scarab beetles etc) (broadscale selective pesticides)
 - notification in Council's block advertising and Council website
 - temporary signs will be displayed during application
 - contact with sports clubs licensed to use the field

Cricket Wickets (turf)

Cricket wickets are areas of relatively intensive pesticide use. Main pesticide uses are selective herbicides to treat broadleaf weeds, and fungicides to treat fungal infection. The following notification procedures will apply:

- wicket areas fenced off during treatment. Signs to be located around the wicket during pesticide use.
- notification on Council website

Swimming Pools

Pesticide applications occur outside the pool operation hours, when the facility is closed to the public. Hence, no notification will be provided for these actions. This includes control of bindii (broadscale selective herbicide) and insects (broadscale pesticide).

Should unscheduled pesticide applications be required during the swimming season, the following notification procedures will apply:

- Spot applications of a selective herbicide for treatment of bindii, and spot applications of selective insecticide for treatment of ants
 - Temporary signs placed at main entrance to swimming pool

Rivers and Foreshores (Excluding Natural Areas and Bushland)

Rivers and foreshores are areas of relatively low pesticide use. Notification procedures for the following pesticides uses will apply:

- rodents (rats) in rock walls or similar places where refuse can accumulate. Application is through 'bait station' which cannot be accessed. A bait station is a PVC pipe or box using only anticoagulant rodenticide.
 - No prior notification will be provided as this is regular and ongoing practice

Coastal Dunes, Natural Areas and Bushland, Natural Wetlands and Vegetated Rivers and Foreshores

These works are primarily bush revegetation works for ecological restoration, replacing weeds with self sustaining native plant communities. Application is through broadscale and spot application of selective and non-selective herbicides.

Notification methods include:

- Council website
- signs placed at access points, roads etc, on the day of application

Pandanus trees can become infected with a planthopper insect. Infected trees are treated by stem injection using a systemic insecticide, with occasional restricted foliar application

- no prior notification will be provided as this is a reactive treatment applied when trees are infected
- for foliar applications only, operator remains on site until the product dries
- signs placed at access points on the day of application
- notification provided to sensitive areas adjacent to treatment site
- staff on ground managing public access to area

Rodents (rats) in rock walls or similar places where refuse can accumulate. Application is through bait stations which cannot be accessed. A bait station is a PVC pipe or box using only anticoagulant rodenticide.

- No prior notification will be provided as this is regular and ongoing practice

Drains and Drainage Systems and Wetlands (Excluding Natural Areas and Bushland)

Drains and drainage systems are generally low use areas, other than where they also function as a public park. Notification procedures for the following pesticides uses will apply:

- weeds and grasses in concrete drains (directed application of non selective herbicide) and areas where no other maintenance access is practical
 - no prior notification will be provided as this is a regular, ongoing practice
 - temporary signs will be displayed on the vehicle during application

- water weeds - noxious species are treated by Far North Coast Weeds in accordance with their Pesticide Notification Plan and requirements of the *Noxious Weeds Act*.
 - notification in Council's block advertising
 - temporary signs displayed during application
- mosquito larvae are controlled through spot application of a selective insecticide. Application is reactive to conditions that encourage mosquito development and frequency therefore varies.
 - no prior notice can given as the activity is weather and condition dependant
- rodents (rats) in rock walls or similar places where refuse can accumulate. Application is through bait stations which cannot be accessed. A bait station is a PVC pipe, or box, using only anticoagulant rodenticide.
 - No prior notification will be provided as this is regular and ongoing practice

Cemeteries

For cemeteries, notification procedures for the following pesticides uses will apply

- Bindii and broad leaf weeds (broadscale selective herbicide). Applications are scheduled and generally occur one per year. Notification procedures will include:
 - notification in Council's block advertising and Council website
 - temporary signs displayed at the entrance on the day of application
- directed application of non-selective herbicide is occasionally undertaken in low use areas that can't be mown (eg steep or inaccessible places)
 - temporary signs will be displayed at the time of application

Caravan Parks

The number of visitors to the First Sun and Suffolk Park Caravan Parks varies according to seasons. Notification procedures for the following pesticides uses will apply:

- Bindii and broad leaf weeds (broadscale selective herbicide). Applications are scheduled and the following notification procedures will apply:
 - notification in Council's block advertising and Council website
 - temporary signs displayed during application
 - notification at caravan park office
 - letter to permanent residents giving prior notice
- directed application of non-selective herbicide is occasionally undertaken in low use areas that can't be mown (eg steep or inaccessible places)
 - Council website
 - signs placed at access points, roads etc, on the day of application
- insect control is occasionally undertaken through application of broadscale selective insecticides. Notification procedures will include:
 - notification on Council website

- notification at caravan park office
- letter to permanent residents giving prior notice
- temporary signs displayed during application
- rodents (rats) in rock walls or similar places where refuse can accumulate.
Application is through bait stations which cannot be accessed. A bait station is a PVC pipe, or box, using only anticoagulant rodenticide.
 - no prior notification will be provided as this is regular and ongoing practice

Road Verges, Road Reserves, Laneways, Pathways and Easements Accessible to the Public

On roadsides and road reserves, notification procedures for the following pesticides uses will apply:

- to control weeds and grasses adjacent to footpaths, kerbs and gutters, guideposts, signposts, headwalls and other infrastructure, a directed application of a non selective herbicide is required. Notification procedures include:
 - no prior notification will be provided as this is a regular, ongoing practice
 - temporary signs will be displayed on the vehicle during applications
- for bush regeneration activities on road verges, see the notification plan for 'Coastal dunes and natural areas'
- weeds and grasses on steep embankments (directed application of non selective herbicide)
 - no prior notification will be provided as this is a regular, ongoing practice
 - temporary signs will be displayed on the vehicle during application

Myocum Landfill

For Myocum Landfill, notification procedures for the following pesticides uses will apply:

- for control of weeds and grasses, both spot and directed applications of a non selective herbicide may be used
 - temporary sign at the entrance to the site
- rodents (rats) in rock walls or similar places where refuse can accumulate.
Application is through bait stations which cannot be accessed. A bait station is a PVC pipe, or box, using only anticoagulant rodenticide.
 - no prior notification will be provided as this is regular and ongoing practice

Buildings Owned or Managed by Byron Shire Council

Regular inspections of buildings for pests such as cockroaches, ants, harmful spiders and rodents are undertaken. Council aims to minimise pesticides in and around buildings by using physical and cultural control methods where possible such as, physical exclusion and habitat reduction.

Where required, Council will continue to undertake spot applications of pesticides as described below. When applications are undertaken outside normal operating hours, no prior notification will apply. When open to the public, notification will be according to spot application requirements.

- Cockroach and ant control may be undertaken with baits. Baits are targeted low-dose applications in small areas. No prior notification procedures apply.
- Spot application of pesticides is undertaken for redback spiders, biting insects, cockroaches and ants as required.
 - temporary signs displayed during application
- After hours directed pesticide application outside normal operating hours. (eg fleas, redback spiders, bird mites, cockroaches)
 - no prior notification
- rodents around buildings treated as required. Application is through "bait station" which cannot be accessed. A bait station is a PVC pipe or box containing anticoagulant rodenticide.
 - no prior notification as this is a reactive treatment applied when buildings are infested>

Sewage Treatment Plants and effluent reuse areas

- Bindii and broad leaf weeds (broadscale selective herbicide). Applications are scheduled and the following notification procedures will apply:
 - notification in Council's block advertising
 - temporary signs displayed during application
- insect control (broadscale application)
 - notification in Council's block advertising
 - temporary signs displayed during application
- for bush regeneration activities at sewage treatment plants and effluent reuse areas, see the notification plan for 'Coastal dunes and natural areas'

Special Measures for Sensitive Places

Clause 11J(1) of the *Pesticides Regulation* (see Appendix 1) defines a sensitive place to be any:

- school or pre-school
- kindergarten
- childcare centre
- hospital
- community health centre
- nursing home
- place declared to be a sensitive place by the Environment Protection Authority (now a part of the Department of Environment and Conservation)

Special notification measures for programmed pesticide use in public places adjacent to schools, childcare centres, hospitals and all other 'sensitive places' will occur in the following ways:

- prior notification will be provided for all properties adjoining scheduled broadscale applications, as scheduled in sensitive places, (bindii and broadleaf weeds, insects) through letters and telephone calls

Special arrangements are in place for areas or residences with special requirements, such as registered organic farms or residents on Byron Shire Council's *Chemically*

Sensitive Register. A register of such locations will be maintained and, where practical, Council will:

- provide prior notification for all scheduled broadscale applications (bindii and broad leaf weeds, ants) for works adjacent to such locations
- minimise other herbicide applications adjacent to the boundary of such locations. This will be achieved by using spot applications (back pack), rather than directed methods of herbicide application and other herbicides, where appropriate.

Notification of Emergency Pesticide Applications

In cases where broadscale emergency pesticide applications in public places is required, notification will be provided to groups licensed to use the site, such as sporting clubs on a sports field, and to sensitive places adjacent to the site.

For spot applications (such as to control wasps, bees etc) an assessment will be made regarding the extent of the application, and therefore the most appropriate notification procedure. Note that most such spot applications are in very restricted areas and notification is not appropriate.

Pesticide Contractors and Lessees of Public Places

Where Byron Shire uses contractors to apply pesticides on its behalf, the same notification requirements apply.

Where persons or organisations hold an existing lease on land that remains a public place, the same notification requirements apply.

4. WHAT INFORMATION WILL BE PROVIDED

In accordance with clause 11L(2)(g) of the Pesticides Regulation, notice of pesticides uses will include the following information:

- the full product name of the pesticide to be used
- the purpose of the application, clearly setting out which pest or pests are being treated
- the proposed date/s, or date range of the pesticide use
- the places where the pesticide is to be used
- contact telephone number and email address of the Council officer who people can contact to discuss the notice
- Any warnings regarding re-entry to the area, if specified on the pesticide product label or the APVMA¹ permit.

5. HOW THE COMMUNITY WILL BE INFORMED OF THIS PLAN

Byron Shire Council will advise residents of this plan and its contents by:

- Making a copy of the plan available for viewing at:
70 - 90 Station Street, Mullumbimby NSW
- Placing a copy of the plan on the website

¹ The Australian Pesticides and Veterinary Medicines Authority (APVMA), the national government body responsible for assessing and registering (or otherwise approving) all pesticide products in Australia and for their regulation up to and including the point of retail sale.

- Placing a notice in the Council's block advertising

6. FUTURE REVIEWS OF THE PLAN

The notification plan will be reviewed every 4-5 years, or when circumstances require a review of the Plan. The review will include:

- a report on progress of implementing the Plan
- public consultation on the notification methods outlined in the Plan. This will involve placing any proposed significant changes on public exhibition and calling for submissions on these proposed changes
- amending the Plan in the light of these submissions

7. CONTACT DETAILS

Anyone wishing to contact Byron Shire Council to discuss the notification plan or to obtain details of pesticide applications in public places should access Council's website at www.byron.nsw.gov.au, or contact:

Hank Bower or Zane Nichol
PO Box 219
MULLUMBIMBY NSW 2482
Phone: (02) 6626 7000
Email: council@byron.nsw.gov.au

Appendix 1: Pesticides Regulation 1995

Part 4B Notification of proposed use of pesticide

Division 1 Operation of Part

11I Date of effect

This Part takes effect at the beginning of 1 February 2007.

Division 2 Notification by public authorities

11J Definitions

(1) In this Division:

pesticide use notification plan means a plan referred to in clause 11L (1).

prescribed public place means:

(a) any of the following to which the public is entitled to have access (whether or not on payment of a fee):

(i) any public garden,

(ii) any picnic area,

(iii) any playground,

(iv) any park, sporting field or oval,

(v) any public land owned or controlled by a public authority (for example, a road verge, rail easement or an easement for electricity purposes or for the purposes of other utilities),

(vi) any land reserved under the *National Parks and Wildlife Act 1974* or any State forest or Crown land, or

(b) the grounds of any government school (within the meaning of the *Education Act 1990*) or any establishment maintained by the Technical and Further Education Commission, but does not include the inside of any building or structure located at such a place.

public authority, in addition to the meaning given by the Act, includes a Minister.

Note.

Public authority is defined in the Act to mean a public or local authority constituted by or under an Act, and to include:

(a) a government department, or

(b) a statutory body representing the Crown, a State owned corporation or a local council, or

(c) a member of staff or other person who exercises functions on behalf of a public authority.

The above definition extends the meaning of the term ***public authority*** for the purposes of this Division so as to include a Minister.

sensitive place means:

(a) any school or pre-school, or

- (b) any kindergarten, or
- (c) any childcare centre, or
- (d) any hospital, or
- (e) any community health centre, or
- (f) any nursing home, or
- (g) any place declared to be a sensitive place by the Environment Protection Authority by notice in the Gazette.

use does not include store.

(2) The Environment Protection Authority may, by further notice in the Gazette, amend or revoke any declaration made under paragraph (g) of the definition of **sensitive place** in subclause (1).

11K Obligations on public authorities concerning use of pesticide

- (1) A public authority must not use any pesticide in a prescribed public place that is owned by or is under the control of the public authority, or allow any person to use any pesticide in a prescribed public place that is owned by or is under the control of the public authority, unless the public authority has first:
- (a) prepared, finalised and notified the Environment Protection Authority of a pesticide use notification plan in accordance with this Division, and
 - (b) given public notice of the proposed use of pesticide in accordance with that plan.

Maximum penalty:

- (a) in the case of a corporation—400 penalty units, and
- (b) in the case of an individual—200 penalty units.

(2) A public authority may satisfy an obligation under this clause if it prepares and notifies one or more pesticide use notification plans that apply to all prescribed public places that it owns or controls.

11L Contents of pesticide use notification plans

- (1) A pesticide use notification plan for a public authority must set out how and when the public authority will give public notice of the proposed use of pesticides in any prescribed public places owned by the public authority or under its control.
- (2) In particular, a pesticide use notification plan:
- (a) must identify where it operates, that is, it must identify the categories of prescribed public places in which the public authority proposes to use pesticide or allow its use, and
 - (b) must identify the categories of, or specific, prescribed public places in respect of which the public authority intends to provide notification of:
 - (i) all proposed uses of pesticides under the plan, or
 - (ii) only some proposed uses of pesticides under the plan, and what those uses are, and
 - (c) must indicate, as a separate item, the special protection measures that will be taken if the pesticide is proposed to be used in a prescribed public place that is adjacent to a sensitive place, and
 - (d) must identify the categories of people (the **affected persons**) who regularly use the categories of prescribed public places identified in the plan, and

- (e) must estimate the degree of use by affected persons of those categories of prescribed public places, and
 - (f) must specify how and when the public authority will notify the affected persons of the proposed use of pesticide in the prescribed public places (other than a prescribed public place referred to in paragraph (k)), and
 - (g) must specify what will be included in that notification, which must include at least the following:
 - (i) the full product name of the pesticide to be used,
 - (ii) the purpose of the use,
 - (iii) the proposed date of use, dates of use or range of dates of use,
 - (iv) the place of use,
 - (v) a contact telephone number or email address for the officer of the public authority whom the affected persons can contact to discuss the notice,
 - (vi) any warnings about limitations on the subsequent use of or entry onto the land if such warnings are specified on the approved label for the pesticide or in the permit for use of the pesticide, and
 - (h) must specify how and when the public authority will inform the general public (and not just the affected persons) of the plan and its contents, and
 - (i) must identify by job title or description, and provide the telephone number or email address of, the officer of the public authority whom any member of the public can contact to discuss the plan, and
 - (j) must set out provisions for future reviews of the pesticide use notification plan, including arrangements for public involvement in those reviews, and
 - (k) must specify the prescribed public places (if any) for which the public authority does not intend to provide notification.
- (3) A pesticide use notification plan for a public authority may, in addition to the matters required by this clause, set out how and when the public authority will give public notice of its use, or its allowing of the use, of pesticide in places other than prescribed public places.

11M Public consultation on draft pesticide use notification plans

- (1) A public authority that has prepared a draft pesticide use notification plan must publish a notice, in accordance with this clause, advising that the plan has been prepared.
- (2) The notice must be published:
 - (a) in the case of a public authority that operates throughout the State—in at least one newspaper circulating generally in the State, and
 - (b) in the case of a public authority that operates only in a particular local area or local areas—in at least one newspaper circulating generally in that local area or those local areas, and
 - (c) in the case of a public authority that is a local council—in at least one newspaper circulating generally in the local government area of that council.
- (3) The notice must specify:
 - (a) the area in which the plan is to operate, and
 - (b) where a copy of the draft plan will be displayed for the purposes of public inspection, and
 - (c) the way in which the public may comment on the draft plan, and
 - (d) the deadline for public comment on the draft pesticide use notification plan (which must be at least 4 weeks after the notice is published).
- (4) A public authority must place its draft pesticide use notification plan on display during office hours at the place mentioned in the notice. The public

authority must make the draft plan available for inspection free of charge.

(5) A public authority must also place its draft pesticide use notification plan on its internet website, if it has one.

(6) The draft pesticide use notification plan must be on display for at least the period commencing on the date on which notice of the display is first given under this clause and ending on the date of the deadline for public comments.

(7) As soon as practicable after the date of the deadline for submissions for public comment, the public authority must prepare a final version of the plan, taking into consideration any comments made by the public before the deadline.

11N Giving notice of final pesticide use notification plans

(1) A public authority that has prepared a final pesticide use notification plan in accordance with this Division must, as soon as practicable after the finalisation of the plan, give notice of the plan in accordance with this clause.

(2) The notice must be published:

(a) in the Gazette, and

(b) in accordance with clause 11M (2).

(3) The notice must specify:

(a) the area in which the plan is to operate, and

(b) where a copy of the plan will be displayed.

(4) A public authority must place its pesticide use notification plan on display during office hours at the main address of the public authority. The public authority must make the plan available for inspection free of charge.

(5) A public authority must also place its pesticide use notification plan on its internet website, if it has one.

11O Notification to the Environment Protection Authority of final pesticide use notification plans

(1) A public authority that has prepared a final pesticide use notification plan must notify the Environment Protection Authority in writing that the plan has been finalised.

(2) Such notice must include a statement as to whether or not clauses 11L, 11M and 11N have been complied with in relation to the plan.

(3) Such notice must be given as soon as practicable after finalisation of the plan.

11P Review of final pesticide use notification plans

(1) A public authority that has prepared a final pesticide use notification plan may review that plan.

(2) If, as a result of that review, a public authority wishes to amend the plan, or adopt a new plan, it must comply with this Division in relation to the making of the amended or new plan unless (in the case of an amendment) the public authority considers on reasonable grounds that the amendment is not of sufficient substance to warrant public consultation, in which case, it need not comply with clauses 11M and 11N.

DRAFT Byron Integrated Weed Management Strategy

Appendix B – Chemically Sensitive Residents Register Application



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E2013/70400

APPLICATION FOR INCLUSION ON COUNCIL'S REGISTER OF CHEMICAL SENSITIVE RESIDENTS AND ORGANIC GROWERS

Name:			
Address:			
Proof of Residence: If you are not the registered property owner you will need to supply proof of residence. This can be a copy of the address section of a current utility account (electricity, gas, phone), or letter/ statement from your financial institution or a copy of your Drivers Licence or Passport. Please phone 02 6685 9319 prior to lodgement if you are not able to supply this information.			
Contact Information:			
Home:		Work:	
Mobile:		Email:	
I understand that Council will provide my information to their Authorised Spraying Contractors for the purposes of notifying me of proposed spraying operations.			
Date:	Signature:		

Reason for inclusion

- ☐ CHEMICAL SENSITIVITY
- ☐ ORGANIC GROWER

As indicated in Council's "Pesticide Use Notification Plan" Authorised Spraying Operators will notify Chemical Sensitive Residents and Organic Growers informing them of proposed spraying operations.

Council reminds residents that if they maintain their road frontage this will alleviate the need for spraying.

To enable records to be kept up to date Council will post a renewal notice for the register in April each year.

Should you have any further enquiries please feel free to contact Council's Depot Administration Officer, Ms Karen Mackay on (02) 6685 9319 at a time of your convenience.

Please post completed form to

The General Manager
Byron Shire Council
PO Box 219
MULLUMBIMBY NSW 2482
Attn: Works Depot

Office Use

Parcel Number			
Register Updated			
Date			
Acknowledgement	#		
GIS Advised		Date:	

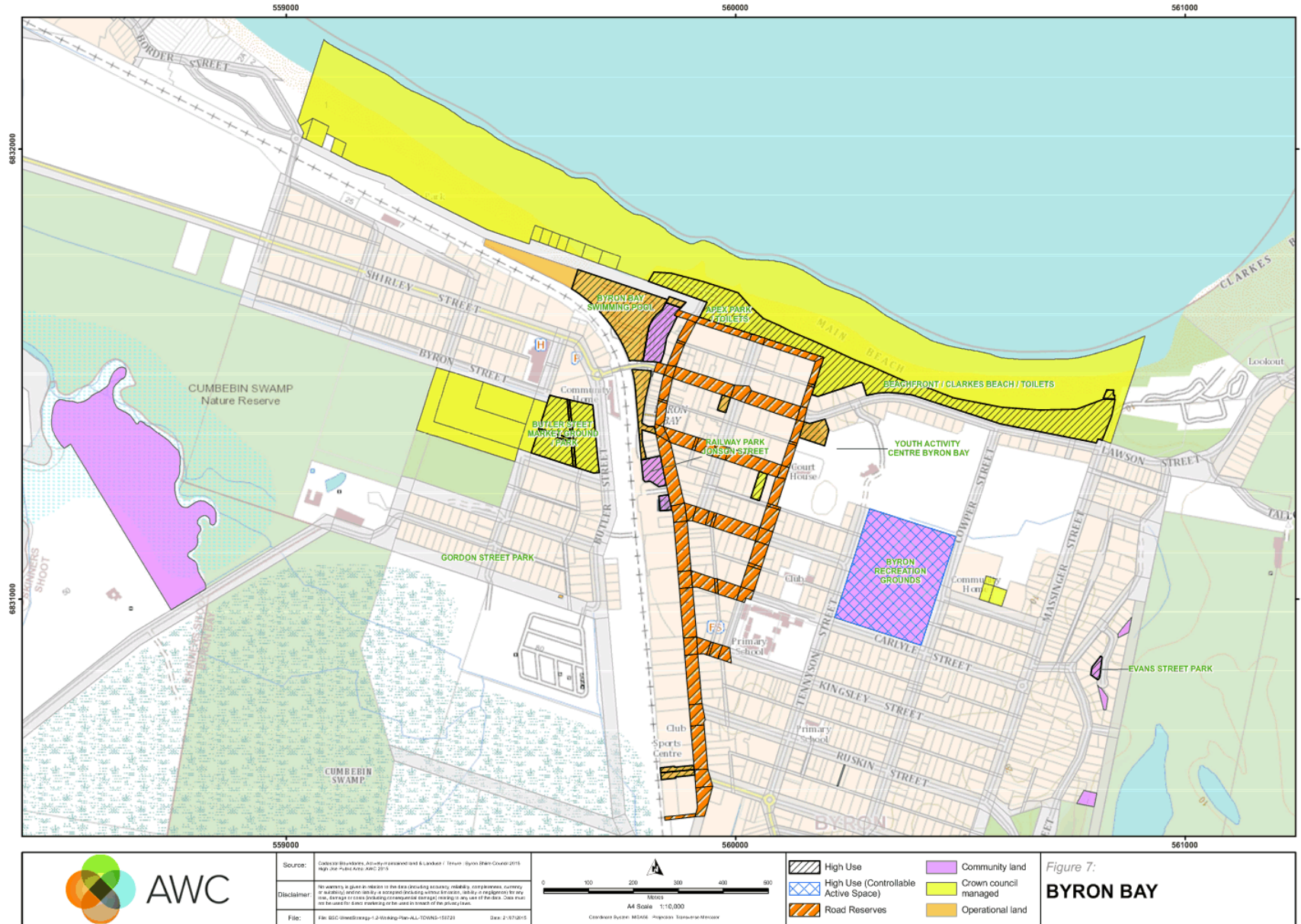
Appendix C – High Use Areas Mapping



BYRON SHIRE COUNCIL

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Appendix D – Known and Potential Weeds in Byron Shire

Table D.1 Weed list for Byron Shire [Source: BSC last updated 22.06.11]

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Abrus precatorius</i>	Crabs-eye Creeper		Known	Potential	X			KTP
<i>Acacia baileyana</i>	Cootamundra Wattle		Potential	Known		X		
<i>Acacia karroo</i>	Karoo Thorn	1	Potential	Potential	X			Alert
<i>Acacia podalyriifolia</i>	Queensland Silver Wattle		Potential	Potential		X		Alert
<i>Acacia saligna</i>	Golden Wreath Wattle		Potential	Known		X		
<i>Acetosa sagittata</i>	Turkey Rhubarb		Known	Known	X			
<i>Agave americana</i>	Century Plant		Known	Known			X	
<i>Ageratina adenophora</i>	Crofton Weed	4	Known	Known	X			
<i>Ageratina riparia</i>	Mistflower	4	Known	Known	X			
<i>Ageratum houstonianum</i>	Billy Goat Crofton		Known	Known		X		
<i>Ailanthus altissima</i>	Tree of Heaven		Potential	Known		X		Casino district
<i>Alocasia aroids</i>	Elephant Ears		Known	Known			X	
<i>Aloe arborescens</i>	Aloe		Potential	Known			X	
<i>Alpinia calcarata</i>	Cardamon Ginger		Potential	Potential		X		
<i>Alternanthera philoxeroides</i>	Alligator Weed	2	Known	Known	X			Alert
<i>Amaranthus spinosus</i>	Needle Burr		Known	Known			X	Common about stockyards
<i>Ambrosia artemisiifolia</i>	Ragweed	5	Known	Known			X	Allergic
<i>Andropogon virginicus</i>	Whiskey Grass		Known	Known	X			
<i>Annona glabra</i>	Pond Apple	1	Potential	Potential		X		Alert
<i>Anomatheca laxa</i>	False Freesia		Known	Potential			X	Naturalized in Byron Bay
<i>Anredera cordifolia</i>	Madeira Vine		Known	Known	X			Spreads vegetatively, KTP
<i>Araucaria bidwillii</i>	Bunya Pine		Potential	Known		X		Can dominate rainforest; falling fruit poses safety issue
<i>Araujia sericifera</i>	Moth Vine		Known	Known	X			Wind dispersed, KTP
<i>Archontophoenix alexandrae</i>	Alexander Palm		Known	Known		X		Crosses with Bangalow Palm
<i>Ardisia crenata</i>	Coral Berry, Ardisia		Known	Known	X			Bird dispersed
<i>Aristolochia elegans</i>	Dutchman's Pipe		Known	Known	X			Fatal to Birdwing Butterfly larvae, KTP
<i>Arundinaria spp.</i>	Creeping Bamboo		Known	Known	X			

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DRAFT Byron Integrated Weed Management Strategy

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Arundo donex</i>	Giant Danube Reed		Potential	Potential		X		
<i>Asclepias curasavica</i>	Red Head Cotton Bush		Known	Known			X	
<i>Asparagus aethiopicus</i> (<i>syn .densiflorus</i>)	Ground Asparagus		Known	Known	X			Bird dispersed, KTP
<i>Asparagus africanus</i> (<i>syn Protasparagus</i>)	Asparagus Fern		Known	Known	X			Bird dispersed, KTP
<i>Asparagus asparegoides</i> (<i>syn Myrsiphyllum</i>)	Bridal Creeper,	5	Potential	Potential	X			Bird dispersed, KTP
<i>Asparagus plumosus</i> (<i>syn Protasparagus</i>)	Climbing Asparagus Fern		Known	Known	X			Bird dispersed, KTP
<i>Asparagus scandens</i> (<i>syn Myrsiphyllum</i>)	Asparagus Fem		Potential	Potential	X			Bird dispersed, KTP
<i>Asparagus virgatus</i>	An Asparagus Fern		Known	Known		X		Bird dispersed
<i>Astroemeria pulchella</i>	Parrot Astroemeria		Known	Known			X	
<i>Asystasia gangetics ssp. micrantha</i>	Chinese Violet	1	Potential	Potential		X		Alert, KTP
* <i>Axonopus compressus</i>	Broadleaf Carpet Grass, Compressum		Known	Known		X		Inhibits regeneration
<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass		Known	Known		X		
<i>Baccharis halimifolia</i>	Groundsel	3	Known	Known	X			Wind dispersed
<i>Bambusa</i> sp	Running Bamboo		Known	Known	X			
* <i>Brugmansia suaveolens</i>	A Datura		Known	Known		X		Alert, colonising creek banks Byrangery & Repentance Creeks
<i>Bryophyllum delagoense</i>	Mother of Millions		Known	Known	X			Listed as noxious in Clarence
<i>Bryophyllum pinnatum</i>	Resurrection Plant		Known	Known	X			
<i>Buddleja davidii</i>	Buddleia		Potential	Potential		X		Allergic
<i>Buddleja madagascariensis</i>	Buddleja, Butterfly Bush		Known	Known	X			Allergic
<i>Cabomba caroliniana</i>	Cabomba	5	Potential	Potential	X			Alert
<i>Caesalpinia decapetala</i>	Mysore Thorn	3	Known	Known	X			KTP
<i>Caesalpinia gilliesii</i>	Bird of Paradise Flower		Potential	Known			X	Alert
<i>Calissia fragrans</i>	Inch Plant, Calissa		Known	Known		X		Vegetatively spread
* <i>Calissia repens</i>	Creeping Inch Plant		Potential	Known		X		Vegetatively spread
<i>Canna indica</i>	Canna Lily, Indian Shot		Known	Known	X			
<i>Cardiospermum grandiflorum</i>	Balloon Vine		Known	Known	X			Water/gravity dispersed, KTP
<i>Carduus nutans</i>	Nodding Thistle	4	Potential	Potential		X		Pasture weed
<i>Casimiroa edulis</i>	White Sapote		Potential	Known		X		Bird & bat dispersed
<i>Catharanthus roseus</i>	Madagascar Periwinkle		Known	Known			X	
<i>Caulerpa taxifolia</i>	Invasive Seaweed		Potential	Potential	X			Alert
<i>Cedrela odorata</i>	Cigar Box Cedar		Potential	Potential		X		Bird & bat dispersed



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DRAFT Byron Integrated Weed Management Strategy

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Celtis sinensis</i>	Chinese Elm, Hackberry	3	Known	Known	X			Bird & bat dispersed
<i>Cenchrus incertus</i>	Spiny Burrgrass	4	Potential	Potential		X		Pasture weed, sandy soils
<i>Cenchrus longispinus</i>	Spiny Burrgrass	4	Potential	Potential		X		Pasture weed, sandy soils
<i>Centaurea maculosa</i>	Spotted Knapweed	1	Potential	Potential		X		Roadsides, wastelands & pasture
<i>Centaurea nigra</i>	Black Knapweed	1	Potential	Potential		X		Roadsides, wastelands & pasture
<i>Cestrum aurantiacum</i>	Orange Cestrum		Potential	Potential		X		Bird dispersed
<i>Cestrum nocturnum</i>	Night Jasmine, Lady of the Night		Known	Known		X		Bird dispersed
<i>Cestrum parqui</i>	Green Cestrum	3	Known	Known	X			Poisonous to stock
<i>Chlorophytum comosum</i> (cv. <i>Variegatum</i>)	Spider Lily		Known	Known		X		
<i>Chromolaena odorata</i>	Siam Weed	1	Potential	Potential	X			Alert
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush	4	Known	Known	X			Bird dispersed, Key threat process
* <i>Chrysophyllum oliviforme</i>	Satinleaf		Potential	Known	X			Alert, Bird dispersed. Known from East Ballina
<i>Cinnamomum camphora</i>	Camphor Laurel	4	Known	Known	X			Not listed as noxious in Byron Shire
<i>Citrus X taitensis</i>	Rough Lemon		Known	Known			X	
<i>Coffea arabica</i>	Coffee		Known	Known		X		Bird dispersed
<i>Colocasia esculenta</i>	Taro		Known	Known			X	
<i>Commelina africana</i>			Potential	Potential			X	Possible garden escape
<i>Commelina benghalensis</i>	Hairy Commelina		Known	Known	X			
<i>Coreopsis lanceolata</i>	Coreopsis		Known	Known		X		Annual, spreads rapidly
<i>Cortaderia selloana</i>	Pampas Grass	4	Potential	Known		X		Weed of wastelands
<i>Corymbia torelliana</i> (syn <i>Eucalyptus</i>)	Cadaghi		Known	Known		X		not readily naturalising
<i>Cotoneaster glycyphylla</i>	Cotoneaster		Potential	Known		X		Weed in temperate regions
<i>Crassocephalum crepioides</i>	Thickhead	Na	Known	Known			X	Readily invades disturbed areas
<i>Crocosmia x crocosmiiflora</i>	Crocosmia, Monbretia		Known	Known	X			
<i>Crotalaria incana</i> subsp. <i>incana</i>	Woolly Rattlepod		Known	Known			X	Weed of roadsides & wasteland
<i>Cryptostegia grandiflora</i>	Rubber Vine	1	Potential	Potential	X			Alert - weed in dry tropics
* <i>Cyperus congestus</i>			Known	Known			X	
<i>Cyperus eragrostis</i>	Umbrella sedge		Known	Known		X		
<i>Cytisus scorpius</i>	English/Scotch Broom	4	Potential	Known	X			Alert - Temperate
<i>Cuphea carthagenensis</i>	Cuphea		Known	Known		X		Weed of wet areas
<i>Cuscuta campestris</i>	Dodder	5	Potential	Potential				



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DRAFT Byron Integrated Weed Management Strategy

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Delairea odorata</i>	Cape Ivy		Known	Known	X			KTP
<i>Dendranthema maxima</i>	Shasta Daisy		Potential	Known			X	
<i>Desmodium intortum</i>	Green-leaved Desmodium		Known	Known	X			
<i>Desmodium uncinatum</i>	Silver-leaved Desmodium		Known	Known	X			Dispersed by attachment
<i>Digitaria aequiglumis</i>	A finger grass		Known	Known				
<i>Digitaria didactyla</i>	Queensland Blue Couch		Known	Known			X	
<i>Dioscorea bulbiferum</i>	Aerial Yam		Known	Known	X			KTP, Marshalls Ck NR, New Brighton
<i>Duranta repens</i>	Duranta		Known	Known		X		Bird dispersed
<i>Eichhornia crassipes</i>	Water Hyacinth	4	Known	Known	X			Alert, aquatic weed
<i>Eleusine tristachya</i>	Goose Grass, Crabgrass		Known	Known			X	Disturbed sites
<i>Epidendrum spp.</i>	Crucifix Orchid		Known	Known			X	
<i>Equisetum arvense</i>	Common Horsetail	1	Potential	Known	X			Alert
<i>Equisetum hyemale</i>	Horsetail	1	Potential	Known	X			Alert
<i>Eragrostis curvula</i>	Love Grass		Known	Known			X	
<i>Eragrostis tenuifolia</i>	Elastic Grass		Potential	Potential			X	
<i>Egeria densa</i>	Dense Waterweed		Known	Known		X		spreading in dam, Myocum
<i>Erica lusitanica</i>	Spanish Heath		Potential	Potential			X	Temperate areas
<i>Eriobotrya japonica</i>	Loquat		Known	Known	X			Bird & bat dispersed
<i>Erythrina crista-galli</i>	Cockspur Coral Tree		Known	Known	X			Water dispersed seed
<i>Erythrina nigra</i>	Orange Coral Tree		Known	Known	X			New Brighton
<i>Erythrina x sykesii</i>	Coral Tree		Known	Known	X			Nectar source
<i>Eugenia dombeya</i>	Dombeya		Potential	Potential			X	
<i>Eugenia jaboticaba</i>	Jaboticaba		Potential	Known			X	Attractive to birds
<i>Eugenia uniflora</i>	Brazilian Cherry		Known	Known	X			Bird dispersed
<i>Euphorbia cyathophora</i>	Painted Spurge		Known	Known		X		
<i>Euryops chrysanthemoides</i>	Euryops		Known	Known			X	Garden escape
<i>Ficus benjamina</i>	Weeping Fig		Known	Known		X		Billinudgel NR
<i>Ficus hilli var microcarpa</i>	Hills Fig		Known	Known		X		Bird & bat dispersed
<i>Ficus elastica</i>	Rubber Tree		Known	Known		X		Planted
<i>Ficus pumila</i>	Climbing Fig		Known	Known		X		Garden escape
<i>Flindersia brayleyana</i>	Queensland Maple		Known	Known		X		Wind dispersed, invades RF
<i>Furcraea foetida</i>			Known	Known			X	Naturalized at Brunswick Hds
<i>Gazania rigens</i>	Gazania		Known	Known			X	Coastal dunes
<i>Genista monspessulana</i>	Cape Broom, Montpellier Broom		Potential	Known		X		Temperate areas
<i>Gladiolus sp</i>	Gladiolus.		Potential	Potential		X		
<i>Gleditsia triacanthos</i>	Honey Locust	3	Potential	Known	X			Vehicle & water dispersed,
<i>Gloriosa superba</i>	Glory Lily		Known	Known	X			Bird dispersed
<i>Glycine javanica</i>	Glycine		Known	Known		X		
<i>Gymnocoronis spilanthoides</i>	Senegal Tea	1	Potential	Potential	X			Alert
<i>Harrisia sp.</i>	Harrisia Cactus	4	Potential	Potential	X			Isolated, from arid areas
<i>Hedera helix</i>	Ivy, English Ivy		Known	Known	X			KTP, Garden escape, vegetative and bird dispersed,



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DRAFT Byron Integrated Weed Management Strategy

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Hedychium coronarium</i>	White Ginger Lily		Potential	Known		X		
<i>Hedychium coccineum</i>	Pink-flowered Ginger		Potential	Potential		X		Fruit bird attractive
<i>Hedychium gardnerianum</i>	Kahili Ginger		Known	Known	X			Goonengerry NP
<i>Hedychium spicatum</i>	White-flowered Ginger		Potential	Potential		X		
<i>Hieracium</i> spp.	Hawkweeds	1	Potential	Potential			X	Weed of roadside & wastelands
<i>Hydrocleys nymphoides</i>	Water Poppy		Potential	Known	X			Planted in dam Mullumbimby Creek, later removed, unknown if spread further.
<i>Hydrocotyle bonariensis</i>	Pennywort		Known	Known			X	Coastal areas
<i>Hygrophila costata</i>	Glush Weed	2	Potential	Known	X			Alert
<i>Hylocerus undatus</i>	Night Flowering Cactus		Known	Known		X		
<i>Hymenocallis caribaea</i>	Spider Lily		Potential	Known		X		
<i>Hypericum perforatum</i>	St John's Wort	4	Potential	Known	X			Temperate
<i>Hypoestes phyllostachya</i>	Freckle Face		Known	Known	X			
<i>Hyparrhenia hirta</i>	Coolatai Grass		Known	Known	X			Seeds stick to animals, machinery and other vehicles
<i>Impatiens walleriana</i>	Balsam, Busy Lizzie		Known	Known			X	
<i>Inga edulis</i>	Icecream Bean		Known	Known		X		Spread by Flying foxes
<i>Ipomoea alba</i>	Moon Flower		Known	Known	X			KTP
<i>Ipomoea cairica</i>	Coastal Morning Glory		Known	Known	X			KTP
<i>Ipomoea indica</i>	Blue Morning Glory		Known	Known	X			KTP
<i>Ipomoea purpurea</i>	Purple Morning Glory		Known	Known	X			KTP
<i>Jacaranda mimosifolia</i>	Jacaranda		Potential	Known		X		Wind dispersed
<i>Jasminum</i> spp (excluding local native spp.)	Jasmine.		Known	Known		X		Vegetatively spreads from gardens, bird dispersed
<i>Koelerutaria paniculata</i>	Golden Rain Tree		Known	Known	X			Wind & water dispersed
<i>Lagarosiphon major</i>	Lagarosiphon	1	Potential	Potential	X			Alert, aquatic weed
<i>Lantana camara</i>	Lantana	4	Known	Known	X			Red flowered form = noxious
<i>Lantana montevidensis</i>	Creeping Lantana	4	Known	Known		X		Crosses with other Lantanas
<i>Leptospermum laevigatum</i>	Coast Teatree		Known	Known		X		Native to south of Nambucca Heads
<i>Leucaena leucocephala</i>	Lead Tree, Coffee Bush		Known	Known			X	
<i>Leycesteria formosa</i>	Himalayan Honeysuckle		Potential	Potential			X	
<i>Ligustrum lucidum</i>	Large-leaved Privet		Known	Known	X			Listed in Coffs and Clarence as noxious
<i>Ligustrum sinense</i>	Small-leaved Privet		Known	Known	X			Listed in Coffs and Clarence as noxious
<i>Lilium formosanum</i>	Formosan Lily		Known	Known		X		
<i>Lonicera japonica</i>	Japanese Honeysuckle		Known	Known	X			KTP



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DRAFT Byron Integrated Weed Management Strategy

Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Lycium ferocissimum</i>	African Box-thorn		Potential	Potential	X			temperate
<i>Macadamia integrifolia</i>	Macadamia Nut (cultivars)		Known	Known		X		Crosses with local threatened Macadamia
<i>Macfadyena unguis-cati</i>	Cats Claw Vine		Known	Known	X			KTP, Isolated infestations
<i>Macroptilium atropurpureum</i>	Siratro		Known	Known	X			
* <i>Mandevilla laxa</i>	Chilean Jasmine		Potential	Known		X		Alert; known from Dorrigo, also Illawarra in warmer rainforest types
<i>Melinis minutiflora</i>	Molasses Grass		Known	Known	X			Inhibits regen, fire hazard
<i>Miconia calvenscens</i> & other <i>Miconia</i> spp.	Miconia	1	Potential	Potential	X			Alert
<i>Mimosa pigra</i>	Giant Sensitive Plant	1	Potential	Potential	X			Alert
<i>Morus alba</i>	Mulberry		Known	Known			X	Bird & bat dispersed
* <i>Murraya koenigii</i>	Curry Leaf Tree		Known	Known		X		increasingly becoming naturalised. Bird dispersed suckers
<i>Murraya paniculata</i>	Murraya		Known	Known	X			Bird dispersed
<i>Myriophyllum aquaticum</i>	Parrot's Feather		Known	Known		X		
<i>Neomarica gracilis</i>	Walking Iris		Known	Known		X		
* <i>Neonotonia wightii</i>	Glycine		Known	Known		X		
<i>Nephrolepis cordifolia</i>	Fishbone Fern		Known	Known	X			Native in hinterland forests
<i>Nephrolepis exaltata</i>	Boston Fern		Known	Known	X			Coastal areas, garden escape not spreading
<i>Nerium oleander</i>	Oleander		Potential	Known			X	
* <i>Nymphaea caerulea</i> subsp. <i>zanzibarensis</i>	Cape Waterlily		Known	Known		X		Widespread
<i>Ochna serrulata</i>	Ochna		Known	Known	X			Bird dispersed
* <i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive		Known	Known	X			Bird dispersed, Known from Wollongbar
* <i>Olea europaea</i> subsp. <i>europaea</i>	Common Olive		Potential	Potential	X			Bird dispersed
<i>Opuntia stricta</i> & other <i>Opuntia</i> spp.	Prickly Pear	4	Known	Known	X			Bird dispersed
<i>Panicum maximum</i> var <i>trichoglume</i>	Hairy Panic		Potential	Potential			X	
<i>Panicum maximum</i> var <i>maximum</i>	Guinea Grass		Known	Known			X	
<i>Parthenium hysterophorus</i>	Parthenium Weed	1	Potential	Potential	X			Alert
<i>Paspalum conjugatum</i>	Sour Grass, Johnston River Grass		Known	Known		X		
<i>Paspalum dilatatum</i>	Paspalum		Known	Known		X		
<i>Paspalum urvillei</i>	Giant Paspalum		Known	Known		X		
<i>Paspalum mandiocanum</i>	Broad-leaf Paspalum		Known	Known		X		
<i>Passiflora edulis</i>	Edible Passionfruit		Known	Known			X	Bird dispersed



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Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Passiflora foetida</i>	Stinking Passionfruit		Known	Known	X			Bird dispersed
<i>Passiflora suberosa</i>	Corky Passionfruit		Known	Known	X			KTP, Bird dispersed
<i>Passiflora subpeltata</i>	White Passionfruit		Known	Known	X			KTP, Bird dispersed
<i>Paulownia tomentosa</i>	Paulownia		Potential	Known			X	Suckers
<i>Pennisetum purpureum</i>	Barner Grass		Known	Known			X	Mainly planted specimens
<i>Pennisetum setaceum</i>	Fountain Grass	5	Potential	Potential			X	
<i>Pereskia aculeata</i>	Lemon Vine, Leafy Cactus, Barbados Gooseberry		Known	Known	X			
<i>Persicaria capitata</i>	Japanese Knotweed		Potential	Known			X	
* <i>Phoenix canariensis</i>	Date Palm		Known	Potential		X		Bird/bat dispersed. Naturalising in Billinudgel NR; roost site for Indian Myna & European Starling
<i>Phyllostachys nigra</i>	Black Bamboo		Potential	Potential			X	
<i>Phytolacca octandra</i>	Inkweed		Known	Known			X	Bird dispersed
<i>Pinus caribaea</i>	Caribbean Pine		Known	Known	X			
<i>Pinus elliottii</i>	Slash Pine		Known	Known	X			
<i>Pinus radiata</i>	Monterey Pine		Known	Known	X			
<i>Pithecotenium cynanchoides</i>	White Trumpet Vine		Known	Potential	X			Roadside sth of Uncle Toms & north west side of Brunswick River bridge
<i>Pistia stratiotes</i>	Water Lettuce	1	Known	Known	X			Native-Nth Territory, aquatic weed
<i>Plectranthus verticillatis</i>			Known	Known	X			Urban areas, New Brighton
<i>Prunella vulgaris</i>	Self Heal		Known	Known			X	
<i>Psidium cattleianum</i>	Cherry Guava		Known	Known	X			Bird & bat dispersed
<i>Psidium guajava</i>	Guava		Known	Known	X			Bird & bat dispersed
<i>Pueraria lobata</i>	Kudzu	3	Known	Known	X			KTP
<i>Pyracantha angustifolia</i>	Orange Firethorn		Potential	Potential		X		Temperate areas
<i>Pyracantha crenulata</i>	Nepal Firethorn		Potential	Potential		X		Temperate areas
<i>Pyracantha fortuneana</i>	Chinese Firethorn		Potential	Potential		X		Temperate areas
<i>Pyrostegia ignea</i>	Golden Shower Vine		Known	Known			X	
<i>Raphiolepis indica</i>	Indian Hawthorn		Known	Known	X			Bird dispersed
<i>Raphiolepis umbellata</i> 'Ovata'	Yeddo Hawthorn		Known	Known	X			Bird dispersed
<i>Ricinus communis</i>	Castor Oil Plant		Known	Known	X			
<i>Rivina humilis</i>	Coral Berry		Known	Known	X			Bird dispersed
<i>Rosa rubiginosa</i>	Sweet Briar		Potential	Potential	X	X		
<i>Robinia pseudocacacia</i>	Black Locust		Potential	Potential	X			Temperate & arid areas
<i>Rubus fruticosus</i> L. complex	Blackberry	4	Known	Known	X			Bird & fox dispersed; several species in complex; similar to some native spp.
<i>Rubus rugosus</i>	Kerry Berry		Potential	Potential		X		



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Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Salix nigra</i>	Black Willow		Potential	Known	X			Listed as Noxious in Clarence
<i>Salix</i> spp.	Willows	5	Known	Known	X			
<i>Salvia coccinea</i>	Red Salvia		Known	Known			X	
<i>Salvinia molesta</i>	Salvinia, Giant Salvinia	3	Known	Known	X			Aquatic weed
* <i>Sanseveriera trifasciata</i>	Mother-in-laws Tongue		Known	Known			X	Garden dumping
<i>Schefflera actinophylla</i>	Umbrella Tree		Known	Known	X			Bird & bat dispersed
<i>Schefflera arboricola</i>	Dwarf Umbrella Tree		Known	Known		X		Bird & bat dispersed
<i>Schinus areira</i>	Pepper Tree		Known	Known	X			Bird dispersed
<i>Schinus terebinthifolius</i>	Broad-leaf Pepper Tree	3	Known	Known	X			Bird & bat dispersed
<i>Schizolobium parahibum</i>	Tower Tree, Schizolobium		Known	Known			X	
<i>Scindapsus aureus</i>	Devil's Ivy		Known				X	Garden dumping, vegetatively dispersed
<i>Senecio macroglossus</i>	Natal Ivy, German Ivy		Known	Known	X			KTP, Vegetatively dispersed
<i>Senecio madagascariensis</i>	Fireweed		Known	Known			X	Listed as Noxious in Coffs, Pasture weed can be toxic to stock
<i>Senna alata</i>	Candle Bush, Candlestick Senna		Potential	Potential			X	Arid areas
* <i>Senna multijuga</i>	November Shower		Potential	Known		X		Mid-north Coast; dispersed by water, vehicle & cultivation
<i>Senna pendula</i> var. <i>glabrata</i>	Winter Senna		Known	Known	X			Bird & ant dispersed
<i>Senna septemtrionalis</i> (syn <i>X floribunda</i>)	Smooth Senna		Known	Known	X			Bird & ant dispersed
<i>Setaria gracilis</i>	Slender Pigeon Grass		Known	Known	X			Bird dispersed
* <i>Setaria palmifolia</i>	Palm Grass		Known	Known	X			
<i>Setaria sphacelata</i>	Setaria		Known	Known	X			Bird dispersed, attachment, vehicles
<i>Solanum capsicoides</i>	Devils Apple		Known	Known			X	Bird & bat dispersed
* <i>Solanum chrysotrichum</i> (syn <i>Solanum hispidum</i>)	Giant Devil's Fig		Known	Known		X		Alert
<i>Solanum mauritianum</i>	Tobacco Bush		Known	Known	X			Bird & bat dispersed
<i>Solanum nigrum</i>	Black-berry Nightshade		Known	Known		X		
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry		Known	Known			X	Bird dispersed
<i>Solanum seafortianum</i>	Climbing Nightshade		Known	Known	X			KTP, Bird dispersed
<i>Solanum torvum</i>	Devil's Fig, Thorn Apple		Known	Known	X			Alert
<i>Solidago canadensis</i>	Canada Goldenrod		Known	Known			X	roadsides
<i>Soliva sessilis</i>	Bindii eye		Known	Known			X	Weed of lawns etc
<i>Sorghum halepense</i>	Johnson Grass		Known	Known		X		
* <i>Sorghum x alnum</i>	Columbus Grass	4	Potential	Known			X	Weed of crops & roadsides
<i>Spathodea campanulata</i> subsp. <i>rotundata</i>	African Tulip Tree		Known	Known		X		Not readily spreading



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Scientific Name	Common Name	Noxious code *	Known /Potential weed in Byron Shire	Known /Potential weed in NE NSW/SE QLD	Serious	Of Concern	Minor	Comments
<i>Sphagneticola trilobata</i> (syn <i>Wedelia</i>)	Singapore Daisy		Known	Known	X			Vegetatively dispersed
* <i>Sporobolus africanus</i>	Parramatta Grass		Known	Known				Disturbed edges, tracks, compacted soil
<i>Sporobolus fertilis</i> (S. <i>indicus</i> var. <i>major</i>)	Giant Parramatta Grass	4	Known	Known	X			Pasture weed
<i>Sporobolus pyramidalis</i>	Giant Rats Tail Grass	3	Known	Known	X			Pasture weed
<i>Stenotaphrum secundatum</i>	Buffalo Grass		Known	Known		X		Readily invades margins of saltmarsh
<i>Syagrus romanzoffiana</i>	Cocos Palm		Known	Known	X			Bird & bat dispersed
<i>Syngonium podophyllum</i>	Syngonium		Known	Known	X			Vegetatively dispersed
<i>Tabebuia chrysantha</i>	Golden Trumpet Tree		Known	Known			X	Seeds prolifically
<i>Talinum paniculatum</i>	Talinum		Known	Known		X		
<i>Tamarix aphylla</i>	Tamarisk, Athel Pine	5	Potential	Potential	X			Temperate & arid areas
<i>Tecomaria capensis</i>	Cape Honeysuckle		Known	Known			X	
<i>Tecoma stans</i>	Tecoma, Yellow bells	3	Known	Known	X			Wind dispersed
<i>Tetrapanax papyrifer</i>	Rice-paper Plant		Known	Known			X	
<i>Themeda quadrivalvis</i>	Grader Grass		Potential	Potential			X	
<i>Thunbergia alata</i>	Black-eyed Susan		Known	Known	X			KTP, Garden escape
<i>Thunbergia grandiflora</i>	Blue Sky Flower		Known	Known	X			KTP, Alert
<i>Tithonia diversifolia</i>	Japanese Sunflower		Known	Known			X	Weed of roadsides & wastelands
<i>Toxicodendron succedaneum</i>	Rhus tree	4	Known	Known	X			Poisonous/allergic
<i>Tradescantia fluminensis</i>	Trad		Known	Known	X			KTP, Vegetatively dispersed
<i>Tradescantia zebrina</i>	Silvery Inch Plant		Known	Known	X			Vegetatively dispersed
<i>Triadica sebifera</i>	Chinese Tallow	3	Known	Known	X			Serious weed of wetlands
<i>Ulex euroaeus</i>	Furze, Gorse		Potential	Potential	X			Listed noxious in Bellingen,
* <i>Urena lobata</i>	Congo Jute		Known	Known			X	Billinudgel & Ocean Shores
<i>Urochloa mutica</i>	Para Grass		Known	Known	X			wetlands
<i>Vinca major</i>	Blue Periwinkle		Known	Known	X			KTP
<i>Watsonia meriana</i>	Watsonia		Known	Known	X			
<i>Xanthium</i> spp.	Burrs (Bathurst, Noogoora, Cockle)	4	Known	Known		X		Weed of crops and livestock
<i>Yucca aloifolia</i>	Spanish Bayonet		Known	Known		X		
<i>Zantedeschia aethiopica</i>	Arum Lily		Known	Known			X	



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Appendix E – Weed Biology Profiles

LEGEND	
HR	<i>Hand Removal</i>
MR	<i>Manual Removal (machinery)</i>
CS&P	<i>Cut Scrape & Paint</i>
Bio	<i>Biological control</i>

Table E.1 Weed biology profiles

Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Acetosa sagittata</i>	Turkey Rhubarb		Vine	Spray, HR	Perennial climber with stems to 3 m or more long. Flowers spring to autumn. Spread by seed, movement of tubers and laterally by rhizomes.
<i>Ageratina adenophora</i>	Crofton Weed	4	Forb	Spray, HR, Slash	Erect many-stemmed perennial to about 2 m tall. Seeds carried by water and by strong wind. Transported in hay, machinery, vehicles, clothing and mud. Flowers produced in profusion in early spring.
<i>Ageratina riparia</i>	Mistflower	4	Forb	Spray, HR, Slash	Spreading, sometimes erect, perennial herb to 1 (rarely to 2) m high. Seed spread by wind and water. Flowers mainly winter and spring.
<i>Ageratum houstonianum</i>	Billy Goat Crofton		Forb	Spray, HR, Slash	Short-lived perennial herb up to one metre high. Seeds spread by wind and water. Flowers most of year, mainly summer.
<i>Alternanthera philoxeroides</i>	Alligator Weed	2	Aquatic	HR	Perennial with mostly hairless surface stems that root at the nodes (stoloniferous) and underground stems producing shoots & roots (rhizomatous). Can form dense mats in or out of water. Viable seed not recorded in Australia. Spread by pieces in mud attached to machinery, in turf and by flood. Breakup of stems and further spread is increased by herbicide use.
<i>Ambrosia artemisiifolia</i>	Ragweed	5	Forb	Spray, HR, Slash	Erect annual herb to 2 (rarely to 3.5) m high. Spread by seed attached to animals or in mud. Flowers late summer and autumn. May cause allergies
<i>Andropogon virginicus</i>	Whiskey Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Anredera cordifolia</i>	Madeira Vine		Vine	Spray, HR, CS&P	Fleshy, sometimes woody, climber with stems extending for 20 m or more. Dispersal: Seed, tubers and spreading root system. Spread by water down watercourses.
<i>Araujia sericifera</i>	Moth Vine		Vine	Spray, HR, CS&P	Perennial climber with twining stems, climbing to 6 m on supporting vegetation. Spread by wind-blown seeds.
<i>Archontophoenix alexandrae</i>	Alexander Palm		Palm	Inject, MR	Palm tree native to northern QLD spread by fruit (bird dispersed).
<i>Ardisia crenata</i>	Coral Berry, Ardisia		Shrub	Spray, HR	Shrub 1–2 m high. Seeds spread by birds. Flowers autumn.
<i>Aristolochia elegans</i>	Dutchman's Pipe		Vine	Spray, HR, CS&P	Perennial climber to 3 m high on supporting vegetation. Spreads by seed. Flowers mainly summer.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Arundinaria</i> spp.	Creeping Bamboo		Shrub	HR, MR	Small shrub, Spreads vegetatively.
<i>Asparagus aethiopicus</i> (syn. <i>densiflorus</i>)	Ground Asparagus		Vine	Spray, HR	Perennial shrub or scrambler, growing from thick tuberous roots formed on the rhizomes. Readily grows from pieces and spreads into the bush from dumped garden waste. Seeds spread by birds and water. Flowers spring to autumn.
<i>Asparagus africanus</i> (syn. <i>Protasparagus</i>)	Asparagus Fern		Vine	Spray, HR	Climber or low shrub with fibrous roots. Stems to about 12 metres long. Seeds spread by birds and water. Rhizomes and fruit containing seeds also spread in dumped garden waste. Flowers mostly spring.
<i>Asparagus plumosus</i> (syn. <i>Protasparagus</i>)	Climbing Asparagus Fern		Vine	Spray, HR, CS&P	Wiry perennial scrambler with fibrous rhizomes and roots, aerial parts to 5 m high on supporting vegetation. Stems to many metres long. Seeds spread by birds and water. Rhizomes and fruit containing seeds also spread in dumped garden waste. Flowers spring to autumn.
<i>Asparagus virgatus</i>	An Asparagus Fern		Vine	Spray, HR	As for <i>A. africanus</i>
<i>Axonopus compressus</i>	Broadleaf Carpet Grass, <i>Compressum</i>		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Baccharis halimifolia</i>	Groundsel	3	Shrub	HR, CS&P	Erect perennial shrub or small tree to 2.5 (rarely to 7) m high. Most spread by wind-dispersed seed. Long distance dispersal also by seeds on animals, in stock feed or in mud on vehicles. Flowers mostly autumn.
<i>Bambusa</i> sp	Running Bamboo		Shrub	HR, MR	Small shrub. Spreads vegetatively.
<i>Brugmansia suaveolens</i>	A Datura		Shrub	HR, CS&P	Large soft-wooded shrub to 2.5 m high. Spread by seed. Flowers spring to autumn.
<i>Bryophyllum delagoense</i>	Mother of Millions		Succulent	Spray, HR	Perennial herb to 1 m high. Dispersal: Seed and by plantlets produced in notches on the margin of the cylindrical leaves. Flowers mainly winter to spring.
<i>Bryophyllum pinnatum</i>	Resurrection Plant		Succulent	Spray, HR	Glauous shrub 0.3–2 m high. Spreads vegetatively.
<i>Buddleja madagascariensis</i>	Buddleja, Butterfly Bush		Vine	Spray, HR, CS&P	Scrambling shrub growing to four metres. Spread by aplanting and escape. Can cause allergies.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Caesalpinia decapetala</i>	Mysore Thorn	3	Shrub	HR, CS&P	Evergreen shrub growing 2–4 m high, or up to 20 m high when climbing over supporting vegetation. Spread by seed dispersed by rodents, birds, cattle and water; also spreads by rooting from nodes.
<i>Calissia fragrans</i>	Inch Plant, Calissa		Forb	Spray, HR	Vegetatively spread
<i>Canna indica</i>	Canna Lily, Indian Shot		Forb	Spray, HR	Erect herbaceous perennial, growing up to two metres tall. Seeds spread by birds, readily regrows from dumped garden waste. Flowers spring–summer.
<i>Cardiospermum grandiflorum</i>	Balloon Vine		Vine	Spray, HR, CS&P	Herbaceous climber with stems to more than 10 m long. Dispersed by seeds, which are transported by wind and water, mostly while attached to membranous inner walls of fruit. rils. Flowers with 4 white petals.
<i>Celtis sinensis</i>	Chinese Elm, Hackberry	3	Tree	HR, CS&P, Inject	Deciduous shrub or tree to 15 (rarely to 25) m high. Seeds spread by birds, fruit bats and water. Flowers late winter to early spring.
<i>Cestrum nocturnum</i>	Night Jasmine, Lady of the Night		Shrub	HR, CS&P	As for <i>Cestrum parqui</i>
<i>Cestrum parqui</i>	Green Cestrum	3	Shrub	HR, CS&P	Woody perennial shrub to 3 m high. Spread by seed which can remain dormant in soil for years. Can be spread by birds excreting seeds, water dispersal, cut root sections and creeping roots. Flowers most of year.
<i>Chlorophytum comosum</i> (cv. <i>Variegatum</i>)	Spider Lily		Forb	Spray, HR	Tufted perennial herb to c. 60 cm high. Spreads vegetatively and by dumping.
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush	4	Shrub	Spray, HR, CS&P	Shrub to 2 m tall. Dispersal: By animals passing the indigestible seeds with a bony covering; also by water. Flowers mainly autumn and winter.
<i>Cinnamomum camphora</i>	Camphor Laurel	4	Tree	Inject, HR, CS&P	Evergreen hardy spreading tree to 20 m high. Seed distributed by birds and water. Flowers spring and summer.
<i>Coffea arabica</i>	Coffee		Shrub	HR, CS&P	Shrub or tree growing to eight metres. Seed spread by birds and animals.
<i>Commelina benghalensis</i>	Hairy Commelina		Forb	Spray, HR	Spreading herbaceous perennial, growing to 50 cm. Spreads vegetatively and by water.
<i>Coreopsis lanceolata</i>	Coreopsis		Forb	Spray, HR	Perennial herbaceous herb forming dense clumps up to 1m high. Seed spread by wind and water, seed-eating birds and through garden waste dumping. Flowers summer.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Corymbia torelliana</i> (syn <i>Eucalyptus</i>)	Cadaghi		Tree	Inject, HR, CS&P	Tree to 30 m high. Seed dispersed. Flowers spring.
<i>Crocosmia x crocosmiiflora</i>	Crocosmia, Monbretia		Shrub	HR, CS&P	Herb 30–100 cm high. Spreads vegetatively and by dumping.
<i>Cyperus eragrostis</i>	Umbrella sedge		Sedge	Spray, HR	Tufted perennial to 90 cm. Spreads by seed, water dispersed. Flowers spring - summer.
<i>Cuphea carthagenensis</i>	Cuphea		Forb	Spray, HR	Erect or spreading herb, growing to 60 cm. Spread by seed and vegetatively. Flowers spring.
<i>Delairea odorata</i>	Cape Ivy		Vine	Spray, HR, CS&P	Climbing and trailing perennial which reaches heights of five metres. Spread by wind, water and animals. Flowers winter.
<i>Desmodium intortum</i>	Green-leaved Desmodium		Vine	Spray, HR, CS&P	Prostrate to scrambling herb with stems to 2 m long. Spread by seed. Flowers mainly summer and autumn.
<i>Desmodium uncinatum</i>	Silver-leaved Desmodium		Vine	Spray, HR, CS&P	Prostrate to scrambling herb with stems to several metres long. Spread by seed. Flowers spring and summer.
<i>Dioscorea bulbiferum</i>	Aerial Yam		Vine	Spray, HR, CS&P	Twining climber with wiry stems. Spreads vegetatively.
<i>Duranta repens</i>	Duranta		Shrub	HR, CS&P	Multistemmed shrub to 4 (rarely to 7) m high. Spread by bat-dispersed and water-dispersed seed. Flowers mostly late spring to autumn.
<i>Eichhornia crassipes</i>	Water Hyacinth	4	Aquatic	Spray, MR, Bio	Free-floating perennial to 65 cm tall. Seeds may germinate within days or may remain dormant for up to 15 or more years. Mainly increases in density by daughter plants produced on stolons.
<i>Egeria densa</i>	Dense Waterweed		Aquatic	MR	Submerged aquatic perennial. Spreads vegetatively.
<i>Eriobotrya japonica</i>	Loquat		Tree	Inject, HR	Evergreen tree to 10 metres. Fruit spread by birds and animals. Flowers autumn with the fruit maturing the following spring.
<i>Erythrina crista-galli</i>	Cockspur Coral Tree		Tree	Inject, HR	Deciduous shrub or tree to 10 m high. Dispersed by seed and vegetatively through pieces of branch or stem that take root in moist soil. Flowers spring
<i>Erythrina nigra</i>	Orange Coral Tree		Tree	Inject, HR	As for other <i>Erythrina</i> sp.
<i>Erythrina x sykesii</i>	Coral Tree		Tree	Inject, HR	Deciduous tree to 15 m high. Dispersed by seed and vegetatively through pieces of branch or stem that take root in moist soil. Flowers most year but chiefly winter to early spring.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Eugenia uniflora</i>	Brazilian Cherry		Shrub	Spray, HR, CS&P	Small tree or shrub to 3 (rarely to 8) m high. Spread by animal-dispersed seed. Flowers autumn to spring depending on location and rainfall.
<i>Euphorbia cyathophora</i>	Painted Spurge		Forb	Spray, HR	Erect annual herb to 1 m. Spread by seed. Flowers most of the year.
<i>Ficus benjamina</i>	Weeping Fig		Tree	Inject, MR	Large ornamental fig. Seeds dispersed by birds and bats.
<i>Ficus hillii</i> var <i>microcarpa</i>	Hills Fig		Tree	Inject, MR	Large ornamental fig. Seeds dispersed by birds and bats.
<i>Ficus elastica</i>	Rubber Tree		Forb	Inject, MR	Large ornamental fig. Seeds dispersed by birds and bats.
<i>Ficus pumila</i>	Climbing Fig		Vine	Spray, HR, CS&P	Woody creeper climbing by adventitious roots. Seeds dispersed by birds and bats.
<i>Flindersia brayleyana</i>	Queensland Maple		Tree	Inject, MR	Tall rainforest tree native to nth QLD. Wind dispersed seed.
<i>Gloriosa superba</i>	Glory Lily		Forb	Spray, HR	Spreading, sometimes climbing, perennial with a robust rhizome and stems to about 3 m long. Spreads by movement of seed and by rhizomes. Flowers late spring to autumn.
<i>Glycine javanica</i>	Glycine		Vine	Spray, HR	Perennial twining or climbing herb. Spread by seed. Flowers all year round but mainly autumn and winter.
<i>Hedera helix</i>	Ivy, English Ivy		Vine	Spray, HR	
<i>Hedychium gardnerianum</i>	Kahili Ginger		Forb	Spray, HR	Rhizomatous perennial to 2 m high. Spread by bird dispersal and movement of seeds and rhizomes. Flowers summer and autumn.
<i>Hylocerus undatus</i>	Night Flowering Cactus		Succulent	Spray, HR	
<i>Hypoestes phyllostachya</i>	Freckle Face		Forb	Spray, HR	Perennial herb or subshrub to 1 m. Spread by seed and vegetatively. May be spread by mowing and slashing.
<i>Hyparrhenia hirta</i>	Coolatai Grass		Grass	Spray, HR, Slash	Tufted perennial to 1.2 (rarely to 1.5) m high. Spread by seed; seeds stick to animals, machinery and other vehicles. Flowers all year round.
<i>Inga edulis</i>	Icecream Bean		Tree	HR, CS&P	Dense crowned tree growing to 30 metres. Seed spread by Flying foxes and birds.
<i>Ipomoea alba</i>	Moon Flower		Vine	Spray, HR, CS&P	As for <i>I. indica</i>
<i>Ipomoea cairica</i>	Coastal Morning Glory		Vine	Spray, HR, CS&P	Perennial herb with twining and trailing stems. Roots tuberous and plant rooting at nodes. Spread by seed and locally by spreading stems.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Ipomoea indica</i>	Blue Morning Glory		Vine	Spray, CS&P, HR,	Twining perennial vine with stems to more than 7 m long. Spreads from existing plantings or garden refuse.
<i>Ipomoea purpurea</i>	Purple Morning Glory		Vine	Spray, CS&P, HR,	As for <i>I. indica</i>
<i>Jasminum</i> spp (excluding local native spp.)	Jasmine.		Vine	Spray, CS&P, HR,	Vigorous climber. Vegetatively spreads from gardens.
<i>Koelreuteria paniculata</i>	Golden Rain Tree		Tree	HR, CS&P	Tree to 25 m high. Spread by seed. Flowers summer and autumn.
<i>Lantana camara</i>	Lantana	4	Shrub	Spray, CS&P, HR,	Variable sprawling thicket-forming perennial shrub to 5 m high and many metres wide or climbing to 15 m high. Spread mainly by bird-dispersed seed; also spread by stems touching the ground and developing shoots and roots (adventitious roots). Flowers most of the year. Red flowered form = noxious
<i>Lantana montevidensis</i>	Creeping Lantana	4	Shrub	Spray, CS&P, HR,	Decumbent shrub, mostly < 0.3 m high, often forming low dense thickets. Spread by birds and animals. Flowers most of the year.
<i>Leptospermum laevigatum</i>	Coast Teatree		Shrub	HR, CS&P	Shrub or small tree to > 4 m high. Spread by seed. Flowers Aug - Oct.
<i>Ligustrum lucidum</i>	Large-leaved Privet		Tree	Inject, CS&P, HR,	Shrub or tree to 12 metres tall. Fruit eaten by birds, especially Currawongs, and seeds dispersed in their droppings. Flowers mostly in summer.
<i>Ligustrum sinense</i>	Small-leaved Privet		Shrub	HR, CS&P	Evergreen small tree to 5 m high. Seed spread by water and birds. Flowers late winter and spring.
<i>Lilium formosanum</i>	Formosan Lily		Forb	Spray, HR	Perennial herb 0.5–2 m high. Spread by seeds, bulbs and bulb scales; spread by water, wind, humans, contaminated soil (earthmoving equipment, car tyres etc) and garden refuse dumping.. Flowers Jan.–Apr.
<i>Lonicera japonica</i>	Japanese Honeysuckle		Vine	Spray, CS&P, HR,	Semi-deciduous scrambling or climbing shrub to 8 m high. Seeds dispersed by water and birds and locally by spreading stems. Flowers mostly spring to autumn.
<i>Macadamia integrifolia</i>	Macadamia Nut (cultivars)		Tree	Inject, CS&P, HR,	Small tree 8-10 metres high. Spread by seed (from cultivation). Fruits in winter.
<i>Macfadyena unguis-cati</i>	Cats Claw Vine		Vine	Spray, CS&P, Bio	Woody climber with stems extending for 20 m or more. Seeds carried by water and to a lesser extent by strong wind. Flowers in spring.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Macroptilium atropurpureum</i>	Siratro		Grass	Spray, HR	Decumbent or twining perennial; stems 2–3 m long. Spreads by seed. Flowers almost all year.
<i>Melinis minutiflora</i>	Molasses Grass		Grass	Spray, HR, Slash	Perennial mat grass up to 90cm in height. Dispersed by wind, vehicles, animals and on clothing. Flowers April - June.
<i>Murraya koenigii</i>	Curry Leaf Tree		Shrub	HR, CS&P	Small tree or shrub. Spread by bird-dispersed seed.
<i>Murraya paniculata</i>	Murraya		Shrub	HR, CS&P	Evergreen small tree or shrub to 12 m high, often multistemmed from base with age. Spread by bird-dispersed seed. lowers irregularly throughout the year but mainly late spring to early autumn.
<i>Myriophyllum aquaticum</i>	Parrot's Feather		Aquatic	MR	Perennial aquatic herb. Stems spreading and erect, to 5 m long, rooting at lower nodes. Spread by stem fragments.
<i>Neomarica gracilis</i>	Walking Iris		Forb	Spray, HR	Perennial herb. Spread vegetatively.
<i>Neonotonia wightii</i>	Glycine		Vine	Spray, HR	As for <i>G. javanica</i>
<i>Nephrolepis cordifolia</i>	Fishbone Fern		Fern	Spray, HR	Tufted erect or arching ferns to 1 m high. Dispersal by spores and locally by stolons.
<i>Nephrolepis exaltata</i>	Boston Fern		Fern	Spray, HR	Tufted erect or arching ferns to 1 m high. Dispersal by spores and locally by stolons.
<i>Nymphaea caerulea</i> subsp. <i>zanzibarensis</i>	Cape Waterlily		Aquatic	MR	Aquatic perennial. Spreads by seed and vegetatively from stolons.
<i>Ochna serrulata</i>	Ochna		Shrub	Inject, HR, CS&P	Shrub to 2.5 m high. Spread by seed (typically bird dispersed).
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive		Shrub	Inject, HR, CS&P	Shrub or branched tree to about 12 m high. Spread by bird-dispersed seed. Also vegetatively by cuttings and pieces. Flowers mostly spring.
<i>Opuntia stricta</i> & other <i>Opuntia</i> spp.	Prickly Pear	4	Shrub	Spray, HR	Erect shrub to 1 m (rarely to 2 m) high. Spread by seed or vegetatively by segments that root where they contact the ground. Flowers late spring to summer.
<i>Paspalum conjugatum</i>	Sour Grass, Johnston River Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed
<i>Paspalum dilatatum</i>	Paspalum		Grass	Spray, HR, Slash	Perennial grass. Spread by seed
<i>Paspalum urvillei</i>	Giant Paspalum		Grass	Spray, HR, Slash	Perennial grass. Spread by seed



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Paspalum mandiocanum</i>	Broad-leaf Paspalum		Grass	Spray, HR, Slash	Perennial grass. Spread by seed
<i>Passiflora foetida</i>	Stinking Passionfruit		Vine	Spray, CS&P, HR	Climbing or scrambling vine up to 9 m high. Spread by seed dispersed by birds and mammals. Flowers most of year.
<i>Passiflora suberosa</i>	Corky Passionfruit		Vine	Spray, CS&P, HR	Perennial vine, climbing via tendrils, to 6 m high on supporting vegetation. Spread by bird-dispersed seed and via trailing stems. Flowers late spring to autumn.
<i>Passiflora subpeltata</i>	White Passionfruit		Vine	Spray, CS&P, HR	Perennial vine, climbing via tendrils. Spread by bird-dispersed seed, animals, water and via trailing stems. Flowers late spring to autumn.
<i>Phoenix canariensis</i>	Date Palm		Palm	Inject, MR	Solitary palm 10-40 metres tall. Seed spread by birds and other animals.
<i>Pinus caribea</i>	Caribbean Pine		Tree	Inject, MR	Tree to 30 m high. Spread by wind-dispersed seed.
<i>Pinus elliottii</i>	Slash Pine		Tree	Inject, MR	Tree to 30 m high. Spread by wind-dispersed seed.
<i>Pinus radiata</i>	Monterey Pine		Tree	Inject, MR	Tree to 30 m high. Spread by wind-dispersed seed.
<i>Pistia stratiotes</i>	Water Lettuce	1	Aquatic	MR	Perennial stoloniferous aquatic herb to 20 cm above water level with feathery roots. Dispersal: By seed and vegetatively by daughter plants at the end of stolons. Seeds, seedlings and mature plants are moved by water and wind.
<i>Plectranthus verticillatis</i>			Forb	Spray, HR	Creeping herb. Spread vegetatively
<i>Psidium cattleianum</i>	Cherry Guava		Shrub	Spray, CS&P, HR	Evergreen tree or shrub that can rapidly form dense thickets. Reproduces from seed and vegetatively by producing suckers from the roots.
<i>Psidium guajava</i>	Guava		Shrub	Spray, CS&P, HR	Shrub or tree to 10 metres. Seed spread by birds and animals. Flowers chiefly in spring.
<i>Pueraria lobata</i>	Kudzu	3	Vine	Spray, CS&P, HR	Perennial twiner or trailer to 18 m high on supporting vegetation. Spread by seed and rooting of runners at nodes. Flowers summer.
<i>Pyrostegia ignea</i>	Golden Shower Vine		Vine	Spray, CS&P, HR	Vigorous climber. Vegetatively spreads from gardens.
<i>Raphiolepis indica</i>	Indian Hawthorn		Shrub	HR, CS&P	Small shrub 1-2 m in height. Seed spread by birds and water.
<i>Raphiolepis umbellata</i> 'Ovata'	Yeddo Hawthorn		Shrub	HR, CS&P	As above
<i>Ricinus communis</i>	Castor Oil Plant		Shrub	HR, CS&P	Spreading shrub to about 6 m tall. Seeds ejected explosively. Flowers late summer.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Rivina humilis</i>	Coral Berry		Forb	Spray, HR	Shrub or perennial herb, mostly 60-100 cm high. Spread by seed. Flowers spring - summer.
<i>Rubus fruticosus</i> L. complex	Blackberry	4	Shrub	Spray, MR	Semi-deciduous scrambler to 2 m high with canes to about 7 m long. Spread by seed, rooting of cane tips and lateral roots producing suckers. Fruit is eaten by birds and mammals (especially foxes). Flowers late spring to summer.
<i>Salix</i> spp.	Willows	5	Tree	Inject, MR	Deciduous trees. Typically spread by rooting of detached twigs and branches, rarely by seed.
<i>Salvinia molesta</i>	Salvinia, Giant Salvinia	3	Aquatic	MR	Free-floating, mat-forming perennial. Reproduces by fragmentation.
<i>Schefflera actinophylla</i>	Umbrella Tree		Tree	Inject, HR, CS&P	Tree to 10 metres. Seeds are readily spread by birds. Flowers autumn
<i>Schefflera arboricola</i>	Dwarf Umbrella Tree		Shrub	HR, CS&P	As above
<i>Schinus areira</i>	Pepper Tree		Tree	Inject, HR, CS&P	Tree to 10 metres. Seeds spread by birds. May spread by suckers
<i>Schinus terebinthifolius</i>	Broad-leaf Pepper Tree	3	Shrub	Inject, HR, CS&P	Sprawling shrub or erect tree to 6 (rarely to 15) m high. Spread by seed, mostly by birds and mammals, also by water. Flowers all year round but with the main flush in autumn and a smaller flush in spring.
<i>Senecio macroglossus</i>	Natal Ivy, German Ivy		Vine	Spray, HR	Evergreen light or slender, twining herbaceous perennial. Seed is spread by wind, humans, contaminated soil (earthmoving equipment, car tyres etc) and garden refuse dumping; vegetatively dispersed.
<i>Senecio madagascariensis</i>	Fireweed		Forb	Spray, HR	Mostly erect annual or biennial herb to 70 cm high. Most spread is by wind dispersed seed. Long distance dispersal also occurs by seeds on animals, in stock feed or in mud on vehicles. Flowers all year, chiefly autumn to late spring.
<i>Senna pendula</i> var. <i>glabrata</i>	Winter Senna		Shrub	Inject, HR, CS&P	Shrub to about 5m tall. Seeds spread by water or in contaminated soil. Flowers autumn.
<i>Senna septemtrionalis</i> (syn <i>X floribunda</i>)	Smooth Senna		Shrub	Inject, HR, CS&P	Shrub 1-3 m high. Seed dispersed. Flowers spring to autumn.
<i>Setaria gracilis</i>	Slender Pigeon Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Setaria palmifolia</i>	Palm Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Setaria sphacelata</i>	Setaria		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Solanum capsicoides</i>	Devils Apple		Shrub	Spray, HR	Annual or short-lived perennial shrub to 1 m high. Seed spread by birds, water. Flowers spring-summer.
<i>Solanum chrysotrichum</i> (syn <i>Solanum hispidum</i>)	Giant Devil's Fig		Shrub	Spray, HR, CS&P	Erect perennial shrub up to 4m high. Seed spread by mammals, birds and bats. Flowers autumn - spring.
<i>Solanum mauritianum</i>	Tobacco Bush		Shrub	Spray, HR, CS&P	Erect perennial shrub up to 4m high. Seed spread by mammals, birds and bats. Flowers autumn - spring.
<i>Solanum nigrum</i>	Black-berry Nightshade		Forb	Spray, HR	Herb or short-lived perennial shrub. Seed spread by birds. Flowers spring.
<i>Solanum pseudocapsicum</i>	Jerusalem Cherry		Forb	Spray, HR	Shrub to 2 m high. Seed spread by birds. Flowers spring-autumn.
<i>Solanum seaforthianum</i>	Climbing Nightshade		Vine	Spray, HR, CS&P	Sprawling perennial shrub or climber. Shrub to 2 m high. Seed spread by birds. Flowers spring- autumn.
<i>Solanum torvum</i>	Devil's Fig, Thorn Apple		Shrub	Spray, HR	Herb or short-lived perennial shrub. Seed spread by birds. Flowers spring.
<i>Sorghum halepense</i>	Johnson Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Spathodea campanulata</i> subsp. <i>rotundata</i>	African Tulip Tree		Tree	Inject, MR	Tree to 20 metres. Seeds spread by birds. May spread by suckers. Flowers throughout year, increasing in spring.
<i>Sphagneticola trilobata</i> (syn <i>Wedelia</i>)	Singapore Daisy		Vine	Spray, HR	Mat-forming perennial herb to 70 cm high, with stems to 2 m or more long. Spread by seed and locally by spreading stems. Flowers spring to autumn.
<i>Sporobolus fertilis</i> (<i>S. indicus</i> var. <i>major</i>)	Giant Parramatta Grass	4	Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Sporobolus pyramidalis</i>	Giant Rats Tail Grass	3	Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Stenotaphrum secundatum</i>	Buffalo Grass		Grass	Spray, HR, Slash	Perennial grass. Spread by seed. Flowers summer
<i>Syagrus romanzoffiana</i>	Cocos Palm		Palm	MR	Palm to 20metres. Seeds spread by birds and animals.
<i>Syngonium podophyllum</i>	Syngonium		Vine	Spray, HR, CS&P	Succulent sprawling vine. Vegetatively dispersed.



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Scientific Name	Common Name	Noxious Code*	Form	Treatment	Comments/biology
<i>Talinum paniculatum</i>	Talinum		Forb		Erect annual herb or subshrub to 60 cm high, with tuberous roots. Spread by seed and dumping. Flowers spring to summer.
<i>Tecoma stans</i>	Tecoma, Yellow bells	3	Shrub	HR, CS&P	Shrub or small tree to 5 m high. Spread by movement of seed. Flowers mainly spring and summer.
<i>Thunbergia alata</i>	Black-eyed Susan		Vine	Spray, HR	Herbaceous perennial twiner. Mainly spread by garden escapes/dumping.
<i>Thunbergia grandiflora</i>	Blue Sky Flower		Vine	Spray, HR	Perennial climber with stems 20 m or more long. Spread by seeds, but most spread is vegetative. Flowers most of year.
<i>Toxicodendron succedaneum</i>	Rhus tree	4	Tree	HR, CS&P	Small tree which can cause severe allergic reactions. Seed spread by birds.
<i>Tradescantia fluminensis</i>	Trad		Forb	Spray, HR	Scrambling perennial with succulent stems that root at nodes to form large clumps. Vegetatively dispersed.
<i>Tradescantia zebrina</i>	Silvery Inch Plant		Forb	Spray, HR	Scrambling perennial with succulent stems that root at nodes to form large clumps. Vegetatively dispersed.
<i>Triadica sebifera</i>	Chinese Tallow	3	Tree	Inject, HR, CS&P	Small tree to 10m. Reproduces by seed and root suckers. Flowers Nov. to Feb, fruits Mar. to May.
<i>Urochloa mutica</i>	Para Grass		Grass	Spray, HR, Slash	Stoloniferous leafy perennial to 2 m high. Spread by seeds and vegetatively. Flowers summer.
<i>Vinca major</i>	Blue Periwinkle		Forb	Spray, HR	Spreading perennial herb to 50 cm high. Spreads locally mainly by stems that root at nodes.
<i>Xanthium spp.</i>	Burrs (Bathurst, Noogoora, Cockle)	4	Forb	Spray, HR	Annual herbs. Spread by seed in burrs, which attach to animals, clothing and are transported in mud and water.
<i>Yucca aloifolia</i>	Spanish Bayonet		Succulent	Inject, MR, HR, CS&P	Evergreen, herbaceous, slow growing perennial shrub. Seed and vegetative reproduction.



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Appendix F – Herbicide Profiles



Table F.1 Summary of general purpose herbicides used by Byron Shire Council

	Glyphosate	Metsulfuron Methyl
Chemical Name	Isopropylamine salt of N – (phosphonomethyl) glycine (56)	Methyl 2-[4-methoxy-6-methyl-1,3,5-triazine-2-ylcarbamoysulfamoyl]benzoate (IUPAC)
Trade Name (s)	Roundup TM , Weedmaster TM	Titan Ag Metsulfuron Methyl TM , Nufarm Associate TM
General	A non-selective systemic herbicide that is applied directly to plant foliage. It is used in a broad range of applications including annual and perennial grasses, broadleaf weeds, woody weeds and trees	A selective systemic herbicide applied directly to plant foliage. Effective on broadleaf weeds and some annual grasses. Particularly effective on plants with bulbs or tubers
Active constituent	Glyphosate 300 – 500 g/l	Metsulfuron 600 g/kg
Mode of action	Disrupts the shikimic acid pathway through inhibition of the enzyme 5-enolpyruvylshikimate-phosphate (EPSP) synthase. The resulting deficiency in EPSP production leads to reductions in aromatic amino acids vital for protein synthesis and plant growth	The mode of action of sulfonylurea herbicides is through the inhibition of plant cell division which directly catalyses the first common step in the biosynthesis of the branched chain amino acids, leucine, isoleucine, and valine, and indirectly disrupts DNA synthesis. This generally occurs in the shoots and the roots of the plant
Mode of action group	M	B
Herbicide poison schedule	Schedule 5 (slightly toxic)	Unscheduled poison (very low toxicity)
Environmental advice (MSDS)	Roundup TM : DO NOT contaminate dams, rivers or streams with the product or used container. When controlling weeds in aquatic situations refer to label directions to minimise the entry of spray into the water	Do not contaminate streams, rivers or waterways with the chemical or used containers. DO NOT apply to weeds growing in or over water. DO NOT spray across open bodies of water.

Table F.2 Summary of general purpose adjuvants used by Byron Shire Council

	Pulse (Surfactant)	Protec (Penetrant)	Herbidye
Chemical Name	Organosilicone based surfactant containing a unique blend of various polymers	Estrified virgin canola oil and non-ionic surfactants	Red AC AZO DYE (RED), Acid Blue 9 Disodium salt (BLUE)
Trade Name(s)	Pulse TM	Protec TM , Protec Plus TM	Herbi Red-Liquid Dye TM Herbi Blue-Liquid Dye TM
General	A non-ionic wetter/spreader/penetrant that is used in conjunction with other herbicides	A non-ionic wetter/spreader/penetrant that is used in conjunction with other herbicides	Used in conjunction with herbicide sprays as a marker which helps to identify areas that have been sprayed
Active constituent	1020 g/L Polyether modified polysiloxane	700 g/L Canola Oil Esther	160 g/L Red AC AZO DYE (RED), 90 g/L ACID BLUE DISODIUM SALT (BLUE)
Mode of action	Acts on spray droplets to produce very low surface tension. This results in plant stomatal flooding, allowing uptake of systematic pesticides through stomata	Used in conjunction with other herbicides to improve wetting, sticking, rain fastness, drift control and plant uptake	N/A
Mode of action group	N/A	N/A	N/A
Herbicide poison schedule	N/A	N/A	N/A
Environmental advice (MSDS)	DO NOT contaminate dams, rivers or streams with this chemical or used container	Dams, waterways and sewers should not be contaminated with this product	Spray drift should be avoided



Table F. 3 Summary of selective herbicides used by Byron Shire Council

	Diclofop Methyl	Sempre	MSMA	Kamba M	Barricade	Jolt
Chemical Name	Diclofop Methyl	Halosulfuron Methyl	Monosodium methanearsonate (MSMA)	MCPA/Dicamba	Prodiamine	2-methyl-4-chlorophenoxyacetic acid (MCPA)
Trade Name(s)	Nugrass™, Hoegrass™	Sempre™	Monopoly™, Arena™	Kamba M™	Barricade™	Jolt™
General	For control of grasses in turf (selective herbicide)	For control of grasses in turf (selective herbicide), predominantly Mullumbimby Couch and Nutgrass	For the control of certain weeds in cotton, sugarcane, turf and non-crop areas.	For the control of certain broadleaf weeds in winter cereals, pastures, turf and non-crop areas	For pre-emergent control of weeds in established turf	For the control of certain broadleaf weeds in turf
Active constituent	375 g/L DICLOFOP-METHYL	750 g/kg HALOSULFURON-METHYL	720 g/L MSMA	340 g/L MCPA (present as the dimethylamine salt) 80 g/L DICAMBA (present as the dimethylamine salt)	480 g/L Prodiamine	300 g/L MCPA
Mode of action	Inhibition of acetyl Co-enzyme A carboxylase (ACCase), a key enzyme in fatty acid biosynthesis in plant chloroplast.	Inhibition of plant cell division in the shoots and the roots of the plant	Foliar absorption; accumulates in root and leaf tips, where it rapidly kills leaf and stem tissue.	Disrupts plant cell growth	Pre-emergent herbicide which works in the top soil layer.	Inhibits carotenoid biosynthesis and disrupts cell growth
Mode of action group	A	B	Z	I	D	Fl
Poison schedule	Schedule 6	Schedule 5	Schedule 7	Schedule 5	N/A	Schedule 5
Environmental advice (MSDS)	Not toxic to birds, toxic to fish, not toxic to bees. DO NOT contaminate streams, rivers or waterways with this product or the used container.	DO NOT contaminate dams, rivers or streams with the product or used container. DO NOT feed grass clippings from treated areas to poultry or other livestock or allow grazing of treated turf.	Dangerous/toxic to fish. Do not contaminate dams, rivers, drains or streams with chemical or used container.	DO NOT contaminate streams, rivers or waterways with the chemical or used containers.	Very toxic to aquatic life. DO NOT contaminate streams, rivers or waterways with the chemical or used containers. DO NOT apply if heavy rain has been forecast within 48 hrs. DO NOT apply to waterlogged soil.	Dangerous to fish and other aquatic life. DO NOT contaminate streams, rivers or waterways with the chemical or used containers.



Table F.4 Summary of pesticides used by Byron Shire Council

	Confidor Insecticide
Chemical Name	Imidacloprid, Mixture of 5-Chlor-2-methyl-3[2H]-isothiazolon and 2-Methyl-2H-isothiazol-3-on, Glycerine
Trade Name (s)	Confidor® Concentrate Insecticide
General	For the control of various insect pests of cotton, fruit, vegetables and ornamentals.
Active constituent	200g/L Imidacloprid
Mode of action	Systemic insecticide which targets sucking insects.
Mode of action group	4A Insecticide
Herbicide poison schedule	Schedule 5 (slightly toxic)
Environmental advice (MSDS)	DO NOT contaminate streams, rivers or waterways with the chemical or used containers. Dangerous to bees. DO NOT spray any plants in flower if bees may forage on treated flowers.

Appendix G – Information Profiles

- Councils bush regeneration team – Fern Beach
- Mullumbimby Community Gardens
- Byron Sportsfields



Bush Regeneration Team

Fern Beach - South Golden Beach, 2007-2013

Setting

The Fern Beach site is a 5 hectare patch of mixed coastal regrowth vegetation located in the north of South Golden Beach, adjacent to Billinudgel Nature Reserve

Vegetation

The vegetation on the site includes elements of the endangered ecological community, Littoral Rainforest as defined by the *NSW Threatened Species Act*. 106 native and 48 exotic plant species have been recorded on the site including two threatened flora species; Pink Nodding Orchid (*Geodorum densiflorum*) and Stinking Cryptocarya (*Cryptocarya foetida*).

Restoration Actions

A variety of tools and techniques commonly employed within the bush regeneration industry were used at Fern Beach including hand weeding, crowning, cut and paint and spraying using herbicide. These were particular to the species of weeds, density and other site constraints. Please see *Byron Shire Bush Regeneration Guidelines 2010* for descriptions of all these techniques.

The aim of these techniques was to remove threats to native vegetation and improve habitat for native species. This involved a two stage process:

Primary Work – initial bitou bush control via manual removal and 'cut and paint' around native trees and foliar spray using herbicide in areas where bitou bush dominated.

Follow up - following the initial bitou control a flush of exotic seedlings germinated including bitou bush, coastal morning glory and glory lily seedlings. These were treated through manual removal and spot spraying to promote the regeneration of native vegetation from seeds stored in the soil. Despite storm damage and a fire through part of the site in 2009 the native vegetation condition and cover increased and the weed density decreased. As the native vegetation matured the shading of understorey increased and the weed cover reduced along with the work inputs, including herbicide use.

Figure 1 shows monitoring data which illustrates the changes in vegetation cover, weed density and the reduction in herbicide use over time (for ease of comparison herbicide has been expressed as ml/hr).

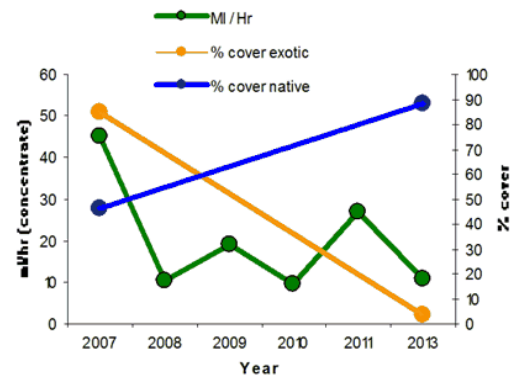


Figure 1: Herbicide use in ml/hr and plant cover % (*Herbicide application is an average for the whole site 2007 - 2013. Percentage cover is an average from two monitoring plots measured in 2007 and 2013.)

Ongoing work is undertaken by voluntary dunecarers and the Bush Regeneration Team.



Before 2007 Area dominated by bitou bush



2013 Regenerating littoral rainforest

Mullumbimby Community Gardens

Mullumbimby Community Gardens is an example of a restoration site where a chemical-free approach has been undertaken. The work has been completed by volunteers (members of the community gardens) under the guidance of professional bush regenerator Dave Rawlins. The site is a small area of disturbed riparian forest dominated by Camphor Laurel with various other woody weeds (Ochna, Umbrella Tree, Night Cestrum etc). Works were informed by a management plan completed by Dave Rawlins whereby Camphor control was completed by ring-barking (removal of the outer bark layer all around the trunk of minimum width 30cm); refer Plate 1. Mature Camphor Laurel at the site were treated this way in 2010. Since that time these trees have required annual follow up treatment to remove bark and suckers. A visit to the site in April 2015 indicates the method has worked reasonably well, with many Camphor Laurel having died, and most others having minimal canopy cover (these trees are expected to die shortly).



Plate 1. Ring-barked Camphor Laurel at Mullumbimby Community gardens

Other primary works at the site required the removal of a midstorey dominated by woody weeds. Again, these works were completed using physical labour – hand-pulling trees and saplings, and using a 'Tree Popper', a tool which levers small trees out of the ground (including the roots). This method has been found to be more efficient than typical 'cut & paint' herbicide methods when conditions are appropriate (eg. following rain when the soil is softer) (pers comm. Dave Rawlins 30/04/2015).

The site has a dense mixed ground layer of ferns and introduced paspalum, which is unusual in disturbed forest where Camphor Laurel is dominant. This ground coverage has assisted in suppressing mass germination of Camphor Laurel (and other weeds), while still enabling germination of some common rainforest species.

As of recently, the Community Gardens has reverted to being under Council management, and as such the regeneration group are no longer active at the site. However, Council has made a commitment to maintaining riparian vegetation at the site by using chemical free methods in keeping with the philosophy of the Gardens community.

Summary:

Mullumbimby Community Gardens – Chemical free restoration	
Pros	Cons
<ul style="list-style-type: none"> • Suitable for community groups where rigid timeframes do not apply • Methods trialled were very successful 	<ul style="list-style-type: none"> • Results from ring-barking are very slow • Methods used are very laborious. Ring-barking in particular is very physically demanding
<ul style="list-style-type: none"> • Due to lack of spraying, the site retained a dense groundcover which reduced weed germination and retained habitat for insects, reptiles etc • Community engagement 	<ul style="list-style-type: none"> • Long-term commitment is required (5-10 years) • Community leadership is required to drive the project.

Byron Sportsfields

Byron Sportsfields is a major sporting facility within town which is managed and maintained by Council. The site supports a number of playing fields and supports a mixed turf dominated by Couch. Management of the site comprises regular mowing and selective weed control when required.

Over recent years, the main playing field (Field No. 1) has been invaded by Crowsfoot Grass (*Eleusine indica*), refer aerial image at Plate 2. Crowsfoot Grass, a robust tussock grass, compromises the playing surface by making it uneven and reducing play quality. The tussocks also represent a tripping hazard.



Plate 2. Crowsfoot Grass infestation (central dark patch) at Field no. 1

Council has addressed the issues using contractors to complete boom spraying using selective herbicides (eg. Diclofop methyl). While this has reduced the infestation to some degree, Byron Bay Football Club (BBFC), principal users of the field have resorted to manual removal of Crowsfoot tussocks using knives. While this method is successful, it is labour intensive and time consuming and not practical in the long term considering a residual seed bank is present. The field has recently been top-dressed which may suppress further germination of Crowsfoot Grass, but this remains an unknown. BBFC have specifically requested that Council maintain herbicide use to adequately control Crowsfoot Grass at the fields.

Appendix H – Herbicide Application Methods

Foliar spraying (spot spray or overspray)

Foliar spraying is generally applied with a low pressure knapsack of approximately 10-15 L capacity although larger units can be employed (e.g. vehicle mounted power spray unit). The majority of the knapsack is filled with water and herbicides, surfactants and marker dyes are added. Common herbicides used in spray packs include Glyphosate and Metsulfuron Methyl, with Pulse the preferred surfactant (Li700 was previously used however Pulse is preferred due to its low odour and good results using low volumes). Marker Dye is also added as to allow the applicator and the community to see where the herbicide has been applied. A ratio of 1:50 Glyphosate to water with 1-2 grams of Metsulfuron Methyl per 10 litres of water is commonly used for foliar spraying on broad range of weed plants and seedlings including seedlings, saplings, low growing vines, weed thickets and low shrubs. Foliar spraying is generally used to cover large areas in a small amount of time where the control of these weeds would otherwise be difficult and costly.

Cut scrape and paint/scrape and paint

The cut scrape paint method is generally applied to small woody weeds and the scrape and paint method is generally for vine weeds. Small woody weeds (e.g. wild tobacco and Camphor Laurel saplings) are cut at the stump followed by the out edge of the cut stump being scraped to expose the outer cambium. The application of herbicide (Glyphosate 100%) immediately follows the scrape using a paint brush and dripper kit or an injector kit. The method of application is similar for vine weeds although the stem is not cut. This allows the transportation of herbicide throughout the plant.

Stem injection

The stem injection method is applied to large trees shrubs and large woody vines. Holes are drilled around the lower basal circumference of the tree and the herbicide is administered to the drill holes with the aid of a stem injector kit or spray pack with the nozzle adjusted to a fine stream at the rate of 1:1.5 parts Glyphosate to water. This method has the benefit of reducing off target damage by only administering herbicide to a small area within the tree. It also has the benefit of leaving tree biomass above the ground which can provide habitat for birds to perch and drop new seed stock which helps with regeneration.

Appendix I – Weed Control by Neighboring Councils

Other Councils in proximity to Byron Shire were contacted to examine weed control methods they utilise as part of their daily operations. As can be seen, weed management methods used in Byron Shire are generally in alignment with those used in neighbouring shires.



Table I.1 Weed management methods practiced by neighbouring Councils

Question	Council		
	Tweed	Gold Coast	Lismore
What herbicides are used by council?	<p>Bushland restoration contractors use glyphosate, metsulfuron methyl and dicamba (Kamba 500); while fluroxypyr (Starane) has been used for basal bark application and cut, scrape and paint for some woody weed species.</p> <p>Recreation Services teams use a range of chemicals for broad leaf weed control in turf areas including Casper Turf Herbicide.</p> <p>The Works Unit controls roadside weeds around guide posts and drainage structures such as header walls, and are restricted in what they are allowed to use which includes glyphosate and metsulfuron methyl.</p>	<p>Natural Areas – Glyphosate, Metsulfuron methyl</p> <p>Parks – Semptra, Dicamba</p>	<p>The majority include: Glyphosate, Bindii Sprays (both Dicamba and MCPA), Crowbar Crowsfoot spray, Ronstar pre-emergent herbicide.</p>

Question	Council		
	Tweed	Gold Coast	Lismore
Is there any planning involved where chemicals are used?	<p>Weed control along the coastal reserve in Tweed (approx 970ha) is coordinated and planned in advance through the Tweed Coast Vegetation Management Committee which included representatives from all land management authorities (Council, NPWS, Crown Lands, TBLALC), FNCW, funding bodies (NCLLS), and bushland restoration contractor representatives to ensure a coordinated approach that avoids, where possible, any overlaps or pockets of infestation.</p> <p>Councils NRM Unit includes a weed control team which manage weeds opportunistically throughout the year and for a targeted effort over the cooler months in the control of Bitou; the unit also works closely with 7 Dunecare groups operating along the coast who undertake weed control as part of their suite of works.</p> <p>Any DuneCare volunteers who apply herbicide must complete ChemCert training and an annual stock take of their holdings of chemicals is undertaken by our Coastal Assets Supervisor who also ensures that they have the current MSDS for each product. All bushland restoration contractors and their staff on our NRM Bushland Regeneration Panel of Providers are also required to have ChemCert qualification.</p> <p>Council maintains a Pesticide Sensitivity Register that is administered through the Works Unit and utilised by them and the NRM and Recreation Services Units, primarily this applies to roadsides and verges where residents do not want chemicals sprayed for a range of reasons e.g. sensitivity to herbicides, organic farm practices, ethical reasons, drinking water catchment areas, etc. This is open to all Shire residents and particularly those who share a boundary with Council managed lands.</p>	<p>Natural Areas - No formal areas but 'Best Practice' techniques are used at all sites including manual control, herbicide, machinery, exclusion, natural regen etc</p> <p>Parks - no chemical free zones but have a 'Significant Roadside Vegetation Program' where limited chemical use is recommended</p> <p>Council maintains a 'Chemically sensitive register' for residents who wish not to herbicides applied adjacent to their properties (Mainly road reserves)</p>	<p>Each application of herbicide is assessed on its merit. This includes an assessment of the locality in terms of use by the public, waterways, weather conditions, targeted weeds, locations to schools etc. Council has a Pesticide Notification Plan which is adhered to. There are currently no registered persons on the chemical sensitive register.</p>

Question	Council		
	Tweed	Gold Coast	Lismore
What methods does council employ for weed management?	All current best practice methods for weed control are utilised: overspraying; power spraying; cut, scrape and paint; cut stump; stem injection; hand removal; mechanical control (tritter, slashing, brush cutting etc); herbicide is used to identify accurately where chemicals have been applied; and a range of biocontrol agents have been used over the years including those for salvinia, bitou bush and cats claw creeper.	Natural Areas – manual (hand work), Cut/Scrape/Paint, Scrape Paint, Frilling, Stem injection, Foliar spraying, Power spraying (mainly reveg). Parks – Power spraying, knapsack, manual,	Generally spraying, stem injection, cut-&-paint, wick wiping, and manual.
Does council have any policies relating to weed management works?	Council requires its employees and contractors working on Council managed lands to abide by the Pesticide Notification Plan and Pesticide Application Standard Operating Procedures which outlines the constraints and safeguards required to apply chemicals in public spaces including the use of signage to advise where they are being applied and any restrictions to entry, contact details, chemical in use etc.	Normal legislative requirements, South East Qld Ecological Framework, Operations manual (specific to each unit)	Pesticide Use Notification Plan provides for how works are completed in a safe manner for staff and the public. Staff are trained and accredited for chemical use and maintain practices within the Pesticide Act and Regulation and the relevant Code of Practice. Various procedures and policies refer to vegetation management activities, but there is no specific policy or procedure.
Other		Commencing steaming pilot July 2015	



Appendix J – Common IARC listed Carcinogens

Table J.1 IARC classifications of some common known, probable and possible carcinogens [Source: IARC Monographs, Volumes 1-112 7 April 2015]

Agent	Group 1	Group 2A	Group 2B
Alcoholic beverages	✓		
Aloe vera, whole leaf extract			✓
Art glass, glass containers and pressed ware (manufacture of)		✓	
Asbestos (all forms)	✓		✓
Bitumens (in various forms)		✓	✓
Bracken fern			✓
Carpentry and joinery			
Coffee (urinary bladder)			✓
Diesel fuel, marine			✓
Dry cleaning (occupational exposures in)			✓
Engine exhaust, diesel	✓		
Engine exhaust, gasoline			✓
Estrogen-progestogen oral contraceptives (combined)	✓		
Gasoline			✓
Ginkgo biloba extract			✓
Glyphosate		✓	
Goldenseal root powder			✓
Hairdresser or barber (occupational exposure as a)		✓	
Kava extract			✓
Lead			✓
Leather dust	✓		
Magnetic fields, extremely low-frequency			✓
Naphthalene			✓
Oil Orange SS			✓
Outdoor air pollution	✓		
Pickled vegetables (traditional Asian)			✓
Salted fish, Chinese-style			✓
Shiftwork that involves circadian disruption		✓	
Solar radiation	✓		
Tobacco (all forms)	✓		
Wood dust	✓		
LEGEND Group 1: Carcinogenic to humans Group 2A: Probably carcinogenic to humans Group 2B: Possibly carcinogenic to humans			

Appendix K – Tweed Shire Council response to IARC

Glyphosate listing

Table K.1 Tweed Shire Council address to employees regarding the recent IARC Glyphosate classification (2A)

You may have heard recent media reports on the use of Glyphosate and the suggestion that it may increase the risk of non-Hodgkin lymphoma (a form of cancer). These reports were based on a report (dated 20/03/2015) from The International Agency for Research on Cancer (IARC), a division of the World Health Organization.

*The report suggested that some studies show that exposure to glyphosate promoted tumours in laboratory mice, and recommended a hazard classification of " Group 2A: "probably carcinogenic to humans." This category is used when there is **limited evidence** of carcinogenicity in humans, and sufficient evidence of carcinogenicity in experimental animals. In scientific terms, evidence cannot be establish that is or is not carcinogenic to humans.*

To put the IARC's classification into perspective, the IARC has previously classified numerous everyday items in Category 2 including coffee, mobile phones, aloe vera extract and pickled vegetables.

Debate on glyphosate toxicity in regards to the effect on human and ecology health has long raged. Indeed the author (Professor Keith Solomon) of the study that the IRAC based it suggestion has since declared (30/03/2015) that the conclusion the IRAC came to is "totally wrong" and that his study was misinterpreted.

What does this all mean?

Around the world the hazardous nature of chemicals is assessed against a detailed criteria known as the Globally Harmonised System (GHS) for the classification of chemicals. The results are published and made publically available through Health and Safety Regulators.

There is not one global regulatory agency (EU, USA, UK, Canada, Aus, Germany) that has changed the classification of Glyphosate to a probable carcinogen. Hazard warnings for Glyphosate remain as:

- *Causes serious eye damage (irritant and corrosive)*
- *Toxic to aquatic life with long lasting effects.*

Appendix L – WHS Fact Sheet: Use of ‘Roundup’





StateCover WHS Fact Sheet Use of 'Roundup' Pesticide

Issue

The World Health Organisation's International Agency for Research on Cancer (IARC) recently announced that formulations containing glyphosate, including 'Roundup' and other similar products, were assessed as '*probably carcinogenic to humans*'.

This contrasts with information included in existing Safety Data Sheets which indicate the relative safety of the chemical.

Australian regulators including Safe Work Australia and WorkCover NSW have not provided advice or direction relating to the use of glyphosate at this time. However, given this new information, it is recommended that Councils take a cautious approach and investigate their use of glyphosate and other hazardous chemicals used for weed control.

Recommended Action:

Council has a legal obligation to manage the risk of any hazardous chemicals used. StateCover recommends that Councils take this opportunity to review their use and management of these chemicals as follows:

1. Conduct a risk assessment of current weed control chemicals to identify your risk level and the individuals at greatest risk of exposure. This should consider:
 - The chemicals used
 - The concentrations used
 - The type and frequency of exposure (eg. pre-mixing requirements, frequency of applications)
2. Consider a range of control measures that reduce risk and ensure best practices when handling chemicals including:
 - Investigate whether glyphosate can be substituted with safer chemicals
 - Increasing the use of alternative methods of weed control including mechanical slashing, hand weeding, steam, etc.
 - Investigating order quantities and packaging to reduce direct handling and mixing of the product
 - Developing hygiene procedures for handling the chemical
 - Reviewing storage and transport practices
 - Developing safe work procedures that include:
 - Instruction on correct application to minimise direct exposure

- Situations where the application of Roundup is not permitted (e.g. during high winds)
 - Requiring use of pre-mixed solutions to reduce exposure where possible
 - Where mixing is required, instructions on mixing including ratios and precautions to take during decanting and mixing
 - Hygiene practices during and after working with or around glyphosate
 - Spill containment and clean-up
3. Consider the introduction of health monitoring where a risk assessment indicates that workers are at a higher level of risk due to the nature of their exposure to glyphosate.

Further Information:

- International Agency for Research on Cancer (IARC) report on the carcinogenicity of five organophosphate pesticides:
<http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf>
- Safe Work Australia - Hazardous Chemicals Requiring Health Monitoring:
<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/hazardous-chemicals-requiring-health-monitoring>
- Safe Work Australia - Health Monitoring for Exposure to Hazardous Chemicals:
<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/health-monitoring-guide-pcbu>

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Approved by: Manager WHS Services	Last updated: 19/05/15	

Appendix M – Bellingen Shire Council Pine Oil Trial



AWC

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9 REPORTS BY DEPUTY GENERAL MANAGER CORPORATE AND COMMUNITY

9.1 BIOWEED TRIAL UPDATE AND THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) ASSESSMENT ON GLYPHOSATE

File/Index: Environmental Management: Planning GA39 / Invasive Plant Management
Author: Daan Schiebaan, Manager Sustainable Environment and Waste and Carmen Muldoon, Invasive Plants Officer

REPORT SUMMARY:

At the 23 April 2014 Ordinary Meeting of Council, Council resolved '*That Council trials the use of the organic pesticide Bioweed, in comparison with current weed control methods, to control invasive plants along pathways and roads in urban areas and the results be presented to Council*'.

This report provides an update on the Bioweed trial currently being conducted by Council; and recommendations for on-going vegetation management activities.

Further, this report also provides a recommendation to Council on the recent International Agency for Research on Cancer (IARC) assessment which classified glyphosate in a group of chemicals that is "*probably carcinogenic to humans*".

REPORT DETAIL:

Bioweed Trials

Background

At the 23 April 2014 Ordinary Meeting of Council, Council discussed the report 'Consideration of Bellingen Green Action Group proposal to cease use of pesticides in the Bellingen Shire by 2015'

As a result, Council resolved –

1. *That Council consults with Bellinger Landcare, as a representative of Landcare groups and other community groups and landholders (such as the farming community) within the Bellingen Shire, in order to obtain their perspective on the implications of ceasing the use of pesticides for weed control within the Shire.*
2. *That Council invites the Bellingen Green Action Group to carry out scientific based trials, including comparisons with current weed control methods, on non-pesticide weed control methods and provide a report to Council. The Bellingen Green Action Group may consider the next round of Council's Environmental Levy Community Fund (up to \$5,000 per project) due for release in July 2014 to fund these trials on public land.*
3. *That Council trials the use of the organic pesticide Bioweed, in comparison with current weed control methods, to control invasive plants along pathways and roads in urban areas and the results be presented to Council.*
4. *That a report with the outcomes of the Bellingen Green Action Group organic weed control trials be presented to Council for further consideration (subject to the Bellingen Green Action Group conducting trials).*

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Pesticides are substances that are used to attract, destroy, or mitigate any pest. Herbicides are a type of pesticide used to treat unwanted plants.

This section of the report will address the third point in the resolution, and provide an update and recommendations using data gathered throughout the Bioweed trial being implemented by Council. This trial has resulted in a significant allocation of both internal and external resources to complete the recommended trials. Council conducted these trials in partnership with the National Parks and Wildlife Service (NPWS).

It is important to note that in regards to the second point in the above noted resolution, the Bellingen Green Action Group did not apply for Council's Environmental Levy Community Fund (up to \$5,000 per project) which opened in July 2014 to assist in trialling alternative weed control methods.

Methodology

To complete the Bioweed trial Council staff considered the main areas that Council uses pesticide products for vegetation management, including weed control. It was determined that the trial be carried out in locations which are typical of environments where Council carries out vegetation management activities.

Therefore, two sites were established. The first of these is the Bellingen cemetery, where the vegetation community, dominated by grasses, is typical of the parks and gardens areas that are managed by Council.

The second site is along part of the Bellinger River, where the vegetation community, including several weed species, is typical of the vegetation managed by Council staff and/or contractors on roadsides, reserves and other public land sites.

To determine the appropriate products to be part of the trial, Council considered the most widely used herbicides for vegetation management, as well as products that may assist in an overall reduction of herbicide use, such as Fulvic acid.

Therefore, it was decided that the following be tested at each site -

1. Metsun 600 (600g/kg metsulfuron-methyl) 1gram in 10 litres of water.
2. Weedmaster Duo 360 (360g/litre glyphosate) at rate of 1part glyphosate:50 parts water (20ml/L)
3. Metsun 600 (600g/kg metsulfuron-methyl) 0.75 grams in 10 litres of water + Fulvic acid 5ml/litre water
4. Weedmaster Duo 360 (360g/litre glyphosate) at a rate of 1 part glyphosate:75 parts water (13.3ml/L) + Fulvic acid 5ml/litre water
5. Bioweed herbicide at label rate of 1 part Bioweed: 5 parts water (200ml/L).
6. Control - no treatment.

Herbicide Product Details

Products with the active ingredient metsulfuron-methyl, including Metsun 600, are a selective herbicide used *'for the control of certain brush and broadleaf species in native pastures, rights of way and commercial and industrial areas and for the control of certain broadleaf weeds in grass pastures and pasture renovations'* as stated on the label. This herbicide is used by

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Council staff and contractors for the selective control of woody weeds and broadleaf weeds to maintain grasses and legumes where required.

Products with the active ingredient glyphosate, including Weedmaster Duo, are non-selective and are used as stated on the label '*for general weed control in Domestic areas (Home gardens), Commercial, Industrial and Public Service areas, Agricultural buildings and other farm situations*'. For treatment details for specific weeds, brush and woody weeds please refer to the label which has an extensive weeds list. This herbicide is used by Council staff and contractors for the control of grasses, broadleaf weeds and woody weeds in a range of situations.

Bioweed is non-selective knock-down and pre-emergent organic herbicide. This product is the focus of the Council Bioweed trial.

Fulvic acid is a fertiliser product. This product was included in the trial as it may be used with herbicides to assist the 'take-up' of herbicide by the target plants, and assist in soil microbe activity. This product may assist in the overall reduction of herbicide used for vegetation management by Council.

Six 2 x 2 metre plots were established for these products and a control. To provide rigour to the trial, the six plots were replicated at each location. Therefore, there are a total of twenty four (24) representative plots for the trial. Each of the six trial plots were set-up as a blind trial, this means that the staff who assessed the results were not aware of the specific herbicide application for each plot. This ensured no potential biased results.

These trial sites were assessed by Council's Invasive Plants Officer and an external representative, National Parks and Wildlife Service, Senior Ranger, Pests – North Coast Region Assessments were completed prior to the application of products, to capture baseline data which detailed the vegetation cover of each plot; and then monthly post the application of products to capture any changes in the vegetation cover of each plot.

The assessments measured the plant species present, which provided a total vegetation cover of the plot. As the full 2 x 2 metre plots were treated the success of each product was analysed by total reduction in vegetation cover.

Results

The Council Bioweed trial at the Bellingen Cemetery and Bellinger River was run for a period of two months. With a baseline assessment completed 9 December 2014; products applied to the trial plots 6 March 2015; and post application assessments completed 1-3 April 2015 and 29 April 2015.

The complete results of the trial to date are provided in attachment 9.2 A to this report. These results are summarised in Table 1 below.

Table 1 – Summary of Results

Herbicide Type	Results - Site 1 - Bellingen Cemetery	Results - Site 2 - Bellinger River	Comments
Metsun 600 (600g/kg metsulfuron-methyl) 1gram in 10 litres of water	Plot 1 = Moderate / Plot 7 = Minor	Plot 1 = Moderate / Plot 7 = Major	Across the four plots this application showed moderate reduction in vegetation cover. With a significant reduction shown following the second month of the

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			trial, in one of the plots on the Bellinger River. These results concur with the type of herbicide used as this does not act well on grass species which are dominate at the Bellingen cemetery; however it does work well on vine and woody weeds, which were dominate at the Bellinger River site.
Weedmaster Duo 360 (360g/L glyphosate) at rate of 1part glyphosate:50 parts water	Plot 2 = Major / Plot 8 = Major	Plot 2 = Major / Plot 8 = Moderate	Across the four plots this application showed significant reduction in vegetation cover. The plots at the Bellingen cemetery site showed almost 100% plant death and subsequent reduction of vegetation. This is a typical response to this herbicide in grass dominated vegetation communities.
Metsun 600 (600g/kg metsulfuron-methyl) 0.75 grams in 10 litres of water plus Fulvic acid 5ml/litre water	Plot 4 = Minor increase in vegetation cover / Plot 10 = Minor increase in vegetation cover	Plot 4 = Moderate / Plot 10 = Major	Results vary across the plots for this application. At the Bellingen cemetery site there was a minor increase in vegetation cover on both plots. However, at the Bellinger River site the reduction in vegetation cover was moderate to major. These results concur with the type of herbicide used as this does not act well on grass species which are dominate at the Bellingen cemetery; however it does work well on vine and woody weeds, which were dominate at the Bellinger River site.
Weedmaster Duo 360 (360g/litre	Plot 5 = Major / Plot 11 =	Plot 5 = Moderate / Plot 11 =	This application showed significant reduction in vegetation cover on

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glyphosate) at a rate of 1:75 plus Fulvic acid 5ml/litre water	Major	Major	three of the four plots; with a moderate reduction in vegetation cover on the fourth plot, at the Bellinger River site. These results are consistent with the type of herbicide glyphosate is, being non-selective and systemic; it provides control across the vegetation types.
Bioweed at label rate of 200ml/litre water	Plot 3 = Initial minor reduction, then overall increase of vegetation cover / Plot 9 = Minor	Plot 3 = Minor / Plot 9 = Minor	Results vary across the four plots for this application. At the Bellingen cemetery site, the first Bioweed plot showed an initial minor reduction in vegetation cover; however the results after two months show an overall increase in vegetation cover. The second Bioweed plot showed an overall minor reduction in vegetation cover; with an initial moderate reduction in vegetation cover, then an increase in the second month. The two Bioweed plots at the Bellinger River site showed an overall minor reduction in vegetation cover.
Control	Plot 6 = Moderate increase in vegetation cover / Plot 12 = Minor increase in vegetation cover	Plot 6 = Moderate / Plot 12 = Minor	A control plot was included in each set of six plots to assess the vegetation growth in comparison to the plots with a product applied. There was increase vegetation cover on the control plots at the Bellingen cemetery site. However, there was an overall reduction in vegetation cover in the control plots at the Bellingen River site. This reduction showed a change in species composition of the plots.

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Key to Table 1 –

1. Minor = 0-30% reduction in vegetation cover
2. Moderate = 31-60% reduction in vegetation cover
3. Major = 61-100% reduction in vegetation cover

In addition to these trials, Council's Gardener and an Maintenance Assistant Town and Parks used Bioweed at some of the key locations frequented for maintenance. This work provided useful additional results to the formal trial plots as follows.

- For a standard maintenance run of Fernmount cemetery 30 litres of mixed Weedmaster Duo (glyphosate 360g/L) at a rate of 1:75 is required. One maintenance run was completed with Bioweed, which required 180 litres of mixed product at a rate of 1:5. This provides a cost comparison of 1. Weedmaster Duo total of \$2.90, to 2. Bioweed total of \$306.00.
- For a period of three months in spring-summer 2014 Bioweed was used for standard park maintenance at Connell Park. For standard parks and gardens maintenance it was required to use Bioweed fortnightly. This is in comparison to the requirement of Weedmaster Duo (glyphosate 360g/L) which is used generally every six weeks in the spring-autumn months for standard park maintenance.
- It was found that for grasses and low vegetation it was possible to get the full plant coverage required for Bioweed to be effective; however it is difficult to do so with vegetation that includes a range of plant types, such as woody weeds and vines growing together.
- In regards to equipment, it was noted that following the use of the Bioweed herbicide for this three month period the rubber diaphragm pump and rubber seals of the spray tanks hardened, with the pump being required to be replaced twice in three months. It was also found that cleaning and maintaining equipment post Bioweed use was a challenge, as it was difficult to wash out and remove the Bioweed product from equipment

Analysis and Discussion

In assessing the trial results it can be seen that the most successful herbicide for vegetation management is glyphosate, providing moderate to major reduction in vegetation cover following application. It is important to note that the same results were provided by glyphosate at a rate of 1:50 and glyphosate at a rate of 1:75 plus Fulvic acid. Therefore, it is recommended that Council includes Fulvic acid in its 'toolbox' of management options for use in controlling weeds, to assist in an overall reduction of herbicide use in the Bellingen Shire.

This is followed by metsulfuron-methyl which provided moderate reduction in vegetation cover following application. Overall results show that vegetation continued to reduce post application of this herbicide. It is again noted that similar results were provided by the lower herbicide rate plus Fulvic acid, therefore it is recommended to include Fulvic acid in the Council toolbox' of management options for use in controlling weeds.

This is followed by Bioweed which provided an overall minor reduction in vegetation cover on all four plots of the trial. The best result provided was at the Bellingen cemetery where an initial moderate reduction in vegetation cover was achieved, however there was then an increase in vegetation cover in the second month of the trial. This shows that applications of Bioweed would need to occur more frequently than the other products for on-going vegetation management.

There are also cost differences in the herbicide products used in the Council Bioweed trial which are detailed in Table 2 below.

Table 2 - Cost comparison of products

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5.1 - ATTACHMENT 1

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Product	Substance	Cost	Volume of concentrate required for vegetation management on 2x2m area
Bioweed	Liquid	\$8.50/litre	1.2 L of mixed product at rate of 1:5. Total cost for plot = \$1.70
Weedmaster Duo (glyphosate 360g/L)	Liquid	\$7.25/litre	255 mL of mixed product at rate of 1:50. Total cost for plot = \$0.36
Metsun 600 (metsulfuron-methyl 600g/kg)	Granule	\$4/100g	250 mL plus 0.25 grams of herbicide for mixed product. Total cost for plot = \$0.01
Fulvic acid	Liquid	\$6.50/litre	255 mL of mixed product at rate of 1:200. Total cost for plot = \$0.03
Weedmaster Duo (glyphosate 360g/L) + Fulvic acid	Liquid	\$7.25/litre	258 mL of mixed product at rate of 1:75 plus Fulvic acid at rate of 1:200. Total cost for = \$0.05
Metsun 600	Granule	\$4/100g	250 mL

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(metsulfuron-methyl 600g/kg) + Fulvic acid			plus 0.1875 grams of herbicide plus Fulvic acid for mixed product. Total cost = less than \$0.04
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As shown in Table 2, the costs of Bioweed are higher than glyphosate and metsulfuron-methyl products. This cost is heightened by the requirement of higher volumes of the product in application for vegetation management, as per manufacturer directions. As shown in Table 2 the higher volume required is generally four times the volume required of the other herbicide products. The requirement for application of these higher volumes also means that the time required for application is more than the time required for application of the glyphosate and metsulfuron-methyl products. Therefore, the use of Bioweed is overall a higher cost for vegetation management than the glyphosate and metsulfuron-methyl products.

Weeds are a key threatening process to the local natural environment and the agricultural industry. They are currently managed according to best industry practice within the context of available resources. Bellingen Shire is a high biodiversity area and has a number of endangered ecological communities (EECs) including lowland subtropical rainforest, wetlands, saltmarshes, Antarctic beech forest and littoral rainforest. Further the Shire is a key agricultural area with beef, dairy, potato and garden farmers. Therefore appropriate, efficient and effective weed control methods need to be implemented.

Controlled and approved usage of herbicides is a key step in the weed management process and to ensure adequate environmental protection is delivered for public land managers.

It is important to note, when implementing weed control, Council will always consider a holistic and integrated approach and therefore utilises a 'toolbox' of management options. These include spraying and stem injection with appropriate herbicides at approved rates, mechanical machinery, manual removal techniques, biological controls and other bush regeneration techniques.

It was noted in the report to Council 23 April 2014, that Bioweed was commencing a research study in 2014 to trial the herbicide on woody weeds. As woody weeds are a significant target of weed control activities throughout the Bellingen Shire, Council was interested to receive the results of these trials and consider the use of Bioweed in the Shire where suitable. Certified Organics are still working on these trials, so there are no formal results as yet. Council staff have been advised by Certified Organics that Bioweed is generally not appropriate for woody weed control; however it may provide some control for select species, such as Blackberry. Council will receive the trial results from Certified Organics once they are completed. If the results of this trial provide information for effective vegetation management, Council will consider Bioweed in its 'toolbox' of management options for use in controlling woody weeds where appropriate and as budget allows.

International Agency for Research on Cancer (IARC) assessment

Background

Concerns have been raised about human exposure in the recent International Agency for Research on Cancer (IARC) assessment which classified glyphosate in a group of chemicals

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that is “probably carcinogenic to humans”. Council was updated on this matter via a “hot topics” email and the General Manager has also updated the media on this matter.

The International Agency for Research on Cancer (IARC) is the specialised cancer agency of the World Health Organisation (WHO).

Provided in attachment 9.2 C of this report, the Bellingen Green Action Group wrote to Council on 26 April 2015 to request Council stop using glyphosate based herbicides following the announcement of the WHO IARC assessment regarding glyphosate. The questions raised in this correspondence are addressed in this report and subsequent recommendations.

The Australian Pesticides and Veterinary Medicines Authority (APVMA)

All herbicides that Council uses have been assessed and are registered on the Public Chemical Registration Information System. The registration process is administered by the Australian Pesticides and Veterinary Medicines Authority (APVMA) an Australian Government statutory authority established to centralise the registration of all agricultural and veterinary chemical products into the Australian marketplace.

Detailed information provided by the APVMA on glyphosate use is provide in Attachment 9.2B

However, the APVMA describes the IARC assessment as follows;

The IARC assessment looks at the intrinsic ‘hazard’ of the chemical glyphosate as a cancer-causing agent only. Other components of the toxicity of glyphosate are not taken into account. As part of the regulatory process, a hazard assessment is just one part of the overall risk assessment required to determine the risks for people using a formulated chemical product.

It is not the role of the IARC to consider how a formulated chemical product is used, or how human exposure can be minimised by following safety directions on a product label. In this regard, the findings of IARC cannot be directly compared to assessments conducted by regulatory authorities for the purposes of approval or registration of a pesticide product, in which are included appropriate risk mitigation measures to allow safe use.

Council's Manager Sustainable Environment and Waste has been seeking further guidance on this matter, in writing from the APVMA. An email update provided by the APVMA to Council on 31 March 2015 states the following;

The APVMA takes any advice from the WHO very seriously which is why we are talking with the Department of Health about the findings to see if they impact on our existing health protection advice for glyphosate products.

All chemicals can be hazardous. People should always follow the safety instructions on product labels as these are designed to reduce people's exposure to the chemical product. The current label instructions, when followed, provide adequate protection for glyphosate products.

Council's Manager Sustainable Environment and Waste sought further advice and a further email update was provided by the APVMA to Council on 30 April 2015 and states the following;

Thank you for your email. I do not have an approximate date for you, the full report has not yet been published. I am giving you a link to our website that refers to the report and glyphosate use <http://apvma.gov.au/node/13891> I hope this link provides additional information for you.

Council's Manager Sustainable Environment and Waste again sought further advice and a further email update was provided by the APVMA to Council on 1 May 2015 and states the following;

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At the moment there are no updates or further information on this matter other than what is on the web page that you have been referred to below.

Analysis and Discussion

Based on this advice, further discussions will be held with Council's Employee Safety and Wellbeing Coordinator. However, until a full risk assessment is conducted by the APVMA and any regulatory action is determined, the APVMA advise that based on current risk assessment the label instructions on all glyphosate products, when followed, provides adequate protection.

To provide adequate notification of herbicide use, Council works that involve herbicide use are carried out in accordance with the Bellingen Shire Council Pesticide Use Notification Plan. After public consultation, this plan was adopted by Council in November 2014. The plan details what, when and how information will be provided to the public regarding pesticide use in public places.

Overall Conclusion

Considering the Council Bioweed trial results and cost comparison of vegetation management products, as well as the feedback provided by Bellinger Landcare provided in Attachment 9.2 D, it is not appropriate to recommend the use of Bioweed for the use of all vegetation management activities in place of the herbicides currently used, including approved products with the active ingredient glyphosate or metsulfuron-methyl.

Further until a full risk assessment is conducted by the APVMA and any regulatory action is determined, the APVMA advise that based on current risk assessment the label instructions on all glyphosate products, when followed, provides adequate protection.

However, in consideration of the concern expressed by some community members regarding the use of glyphosate in the Bellingen Shire, it is recommended that Council considers Bioweed in its 'toolbox' of management options for use in controlling weeds where and when appropriate and as budget allows. In particular, this may include for the maintenance of grass and broad leaf weeds on local roadsides, pathways and reserves in urban township environments.

BUDGETARY IMPLICATIONS:

The use of any method and/or product for vegetation management involves a cost. Therefore, it is important to consider all options for vegetation management, including the most cost effective and efficient methods of weed control.

SUSTAINABILITY ASSESSMENT:

The on-going management of vegetation including weeds in the Bellingen Shire contributes to the well-being of the community through the protection of natural and recreational areas.

Vegetation management, including weed control through the implementation of the North Coast Weeds Advisory Committee Weeds Action Plan and management of noxious weeds contributes to the economic well-being of the community through the reduction of impacts on primary production agricultural land.

Vegetation management contributes to the protection of the environment and biodiversity in the Bellingen Shire through the management of the identified key threatening process of weed impact on natural areas, including EECs in the Shire.

ENGAGEMENT:

The Bellingen Shire Council Community Engagement Strategy was adopted by Council at its Meeting 22 February 2012. This strategy is designed to outline the approach Bellingen Shire takes towards engaging with our community.

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Having regard to the Bellingen Shire Council Community Engagement Strategy, it is considered that vegetation management, including consideration for management methods, is appropriately categorised as having a LEVEL 1 – High Impact – Bellingen Shire.

Essential engagement measures for Level 1 - High Impact – Bellingen Shire are to inform, consult, involve and collaborate. Specific essential engagement tasks are 'inform' through written correspondence, mail out; and web-site information/updates; and 'involve' through meetings with key stakeholders.

Council's Invasive Plants Officer has on-going consultation with the community through the implementation of the North Coast Weeds Action Plan. Community engagement is carried out in an on-going manner through the methods described in the previous paragraph.

Additional to this, Council's Manager Sustainable Environment and Waste and Invasive Plants Officer met with a representative of the Bellingen Green Action Group and held initial discussions on how Council can work with the community to achieve required weed control and vegetation management outcomes; and consider methods to reduce the use of pesticides, including glyphosate.

Council is willing to continue these discussions in a respectful manner and provide technical support to the Bellingen Green Action Group in implementing trials for non-pesticide weed control methods.

Further Bellingen Landcare have been consulted on this matter, and in response to the Council resolution one (1) *That Council consults with Bellinger Landcare, as a representative of Landcare groups and other community groups and landholders (such as the farming community) within the Bellingen Shire, in order to obtain their perspective on the implications of ceasing the use of pesticides for weed control within the Shire*, Council has received a formal response from Bellingen Landcare which is provided in Attachment 9.2 D.

This response has been considered with the Bioweed trial results to inform the recommendations provided in this report.

SHIRE OF BELLINGEN 2030 COMMUNITY VISION ALIGNMENT:

The weed management services delivered by Council align with the following strategic directions within the Shire of Bellingen 2030 Community Vision:

The vegetation management and weed control aligns with the strategic directions of the Living Environment theme within the Shire of Bellingen 2030 Community Vision.

Particularly the strategic directions of '*We protect and enhance our biodiversity*' and '*We work together to protect and enhance our environment*'. Weeds are a direct threat to maintaining biodiversity in the Bellingen Shire.

Vegetation management and weed control also aligns with the strategic directions of the Places for People theme within the Shire of Bellingen 2030 Community Vision. Particularly the strategic directions '*We have a diversity of beautiful spaces that foster community happiness and well-being*'.

Currently, vegetation management activities; and the management of weeds through the implementation of the North Coast Weeds Action Plan is a key element in addressing these strategic directions.

OFFICERS RECOMMENDATION:

- 1 That Council considers Bioweed in its 'toolbox' of management options for use in controlling weeds where and when appropriate and as budget allows. This may include for maintenance of grass and broad leaf weeds on local roadsides, pathways and reserves in urban township environments.

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- 2 That Council includes Fulvic acid in its 'toolbox' of management options for use in controlling weeds, to assist in an overall reduction of herbicide use in the Bellingen Shire.
- 3 That Council continues to investigate suitable alternative products for vegetation management such as pelargonic acid; and that these products are considered in Council's 'toolbox' of management options for use in controlling weeds where and when appropriate and as budget allows.
- 4 That Council continues to proactively seek advice on glyphosate use from the APVMA and implement any regulatory action required. Should there be any changes recommended to this position an update to Council will be provided.
- 5 That the ongoing use of glyphosate is discussed in detail with the Employee Safety and Wellbeing Coordinator and should there be any changes recommended to this position an update to Council be provided.

ATTACHMENTS:

There are four attachments for this report.

- 9.1A Council Bioweed trial results
(DWS 532878)
- 9.1B APVMA – Information about glyphosate use
(DWS 532899)
- 9.1C Correspondence from Bellingen Green Action Group
(DWS 532902)
- 9.1D Bellinger Landcare Inc. position on the use of herbicides in land management – May 2015
(DWS 532903)

Report DW 533450



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