

B

Weed Control Plan

Greys Beach and The Grotto

Weed Management Plan

Prepared by GeoLINK to accompany the
Greys Beach and The Grotto Plan of Management
January 2004

1.0 Introduction

For any weed management plan program for the study area to be effective, a number of considerations need to be examined. Some elements of a successful weed management plan might include:

- biology of weed species;
- location;
- climate;
- rainfall;
- soil type;
- runoff;
- terrestrial flora and fauna;
- aquatic flora and fauna;
- water depth and quality;
- current uses; and,
- existing land and water management.

These elements need to be explored for each individual weed species identified at the site. Management plans for each weed species must also be considered collectively to select the most appropriate, cost effective and efficient management program for the entire site. Generally, weed management has one of the following goals:

1. weed eradication for maintenance; or
2. weed control to stimulate regeneration.

Different weed control techniques apply to each objective.

A number of weed management options are available for different weed species. A general description of each process is given below. Examples of possible management plans for individual weed species are also given. This is followed by a potential weed management plan that considers the different sections of the study area.

2.0 Control Methods

2.1 Physical

There are two types of physical control methods: mechanical and hand techniques.

Mechanical control methods for weeds might include:

- mowing/slashing;
- clearing/removal using large earthmoving equipment (e.g. use of a wire or chain rope anchored at a point and dragged by a tractor or equivalent);
- landscaping/burying with 'clean' fill; and,
- for aquatic weeds, netting, and mowing using specialised equipment.

Hand removal techniques are, in general, small-scale versions of mechanical techniques and include:

- hand pulling;
- removal of flowering heads (i.e. seed source); and,
- for aquatic weeds hand netting and other netting devices (e.g. chicken wire fencing).

Care needs to be taken with weed species that can spread via stem fragments. In these cases physical means of control is not advisable as all the stem fragments must be collected and disposed of adequately, otherwise the above procedures may exacerbate the problem.

For aquatic weeds, chemical control methods may threaten fish life due to depletion of oxygen levels through the breakdown of vegetation. Mechanical options may be better suited as this method physically removes the vegetation. However, mechanical options can result in a number of other adverse environmental effects. Use of heavy equipment near or in waterways can result in disturbing sediment via runoff or in the waterways itself, which, in turn, would increase turbidity and adversely affect the hunting and survival ability of fish and amphibians. In addition, bird species utilising the waterway may be adversely effected by a decrease in water visibility and reduced effectiveness of their hunting expeditions. Dust and noise from machinery could also adversely impact on fauna species in the vicinity.

Hand control techniques, while being time consuming and therefore often expensive, do not adversely impact on the habitat conditions of waterways to the same level as mechanical means. In addition, hand control techniques are, in general, extremely effective for small infestations.

2.2 Biological

Biological control involves the use of a natural predator of the problem weed. In the long term, this control method can be cost effective and environmentally friendly. However, it is rarely the complete solution for a weed problem and in most cases cannot completely eradicate a weed. Instead, this method generally functions to suppress a weed to keep the area economically or ecologically viable.

A good example of a successful biological control agent in Australia is the Cactoblastis moth (*Cactoblastis cactorum*). This South American moth was introduced to Australia in the 1920's to combat the large infestation of Prickly pear (*Opuntia inermis*), also a native of South America, across the country.

Unfortunately in a number of cases, no biological control agent has been located for a number of weed species in Australia. Care must be taken in the event of a biological control agent being recognised. For example, the introduction of the cane toad (*Bufo marinus*), a native to Venezuela, to Australia to control cane beetles in sugar cane, has led to an overpopulation of this pest species. This has resulted in the death of a number of native Australian fauna species and no control on the insect pests. A number of years is required by researchers to assess the organism and demonstrate it does not attack economic crops or native plants and animals prior to introduction to Australia.

2.3 Chemical

Chemical (herbicide) control methods are widely used in weed management programs. Herbicides can be grouped into either contact or translocated based on their mode of action to kill the desired weed (NSW Agriculture, 2001). For instance, contact herbicides kill those parts of the plants in which they directly contact (e.g. leaves and stem). Translocated herbicides need to move within the plant to the site of action. Contact herbicides tend to be more effective on annual weeds or on the seedlings of perennial weeds. Whereas, translocated herbicides tend to be more effective on grasses and broadleaf weeds. Herbicides can be selective, non-selective, residual and/or pre-emergent.

As with all chemicals, there are numerous application techniques and equipment available to apply herbicides. For example, equipment which might be utilised in applying herbicides include boom sprayers, hand guns, knapsacks, granular soil applicators and aerial sprayers. Methods that might be employed include foliar spraying, cut stump and stem injection.

As with all the weed control methods, consideration of the weed species, infestation, topography, access and the potential environmental and health hazards need to be assessed to determine which equipment and application methods are best suited to control the weed.

Where the weed is located near a water course, care must be taken if the water is used for stock, domestic purposes or watering gardens and crops. There are some herbicides available which are suitable for use near waterways (e.g. Roundup® Biactive and Weedmaster® Duo). In general, the use of herbicides for controlling

small weed infestations near waterways is appropriate (NSW Agriculture, 1998). This is because small infestations require small amounts of chemical to be applied and the resultant water contamination is minimal. Whereas, in large infestations, the resultant degradation of plant material can cause deoxygenation of water to sufficient levels to kill fish.

The use of any chemical product should be implemented with caution. The material safety data sheet and label should be read thoroughly prior to use. For use near waterways, various publications highlighting the general procedures for use of herbicides near water should be followed (e.g. NSW EPA Draft: Guidance for the Use of Herbicides Near Water, 2000; NSW Agriculture Noxious and Environmental Weed Control handbook 2001/2002 - A guide to weed control in non-crop, aquatic and bushland situations, 2001).

In summary, these publications recommend the following procedures be followed:

- thoroughly read and comply with label directions and legislation;
- handle and store herbicides correctly;
- maintain application equipment properly;
- apply herbicides correctly and efficiently;
- dispose of, or reuse, waste properly;
- notify neighbours and follow withholding periods;
- keep accurate records; and,
- obtain training as required.

The use of any chemical including herbicides, may result in resistant strains of the pest to develop. Glyphosate is one such chemical that is known to cause resistance in weed species (NSW Agriculture 2001). Care should be taken when using the above-mentioned chemicals to avoid resistance developing in any weed population.

2.4 Environmental Management

This control option relies on altering the environment in some way that will limit the growth of weed species. The core strategy to this method is management. Items which could be considered are reforestation, rehabilitation, plant vigour, mulching, hygiene and early weed identification. These options are briefly described below.

1. Reforestation is a long-term weed control method which aims to provide a dense tree canopy to limit weed growth through the restriction of sunlight to the forest floor.
2. Rehabilitation is similar to reforestation and can work well together. In reforestation, tree species are planted to provide a canopy. Rehabilitation methods tend to assist a local population of native species to recolonise an area by way of controlling the competing weed species and thereby stimulate regeneration.
3. Plantings or assisted germination of native or desirable species require care during the initial stages of their life. Plantings must be maintained (e.g. weeded, fertilised) to obtain a plant vigour that will outcompete weed species in the area.
4. Mulching provides a physical barrier to the germination of weed species. Barriers such as weed matting and woven paper and cloth products have been used successfully in a variety of situations. This option is good for small areas especially for a dual role in bank stabilisation and erosion.
5. Hygiene is important to stop the entry of additional or new weeds entering the weed control area. For a public area this can be difficult. However, public education through signage and pamphlets may assist. In addition, any work vehicles or equipment used in weed control should be thoroughly cleaned prior to and after entry onto the site.
6. Early weed identification is essential to providing the most effective control on a site. A small infestation, no matter which control option is employed, is always easier to contain than a large infestation.

In the case of aquatic weeds, a number of environmental management options can be used and include:

1. Emptying of the waterbody, if possible, and allow the bed to dry for several weeks. The success of this method depends upon the plant material sufficiently drying out to achieve death.
2. Dredge and/or excavate parts of the waterway to depths where the plant cannot survive (approximately 3 to 4 metres). In many cases, this option must allow for a number of measures to be implemented to ensure public safety. For example, steep slopes at the bank edge could provide instability for persons standing or walking on the edge increase the chance of drownings by young children that may venture close to the edge.
3. Provide shading along the banks with trees which will limit the growth of the weed. This option has the added benefit of providing bank stabilisation but can result in a loss of access to the waterway's bank unless formal access points and facilities are provided.
4. Limit the influx of nutrients into the waterway. For rivers this can be difficult as a number of nutrient sources may occur upstream (e.g. stormwater, farming practices, industrial areas). The distribution of leaflets to local residents outlining waterwise options available to them (e.g. "The Drain is for Rain" campaign) may help alleviate this problem. Additionally, the complementary plantings of trees outlined above combined with plantings of native aquatic plants can assist in using nutrients that enter the lake system. The planting of native aquatic plants will also compete with the weed, thereby assisting in its control.

2.5 Option Comparison

The following table highlights the positives and negatives for each of the control methods outlined above.

Table 1 Comparison of Control Method Options

Control Method	Positives	Negatives
Physical		
Mechanical	relatively fast, not labour intensive	can exacerbate the problem, can be expensive, can cause extensive ecological damage
Hand	low impact on environment	labour intensive, slow, can exacerbate the problem
Biological	environmentally sound	cannot eradicate the problem
Chemical	can provide fast control of a weed	possible environmental and health hazards, resistance can develop in weed species, can adversely effect fish through deoxygenating of waters
Environmental Management	can provide sound, environmentally sensitive control	can be expensive

2.6 Recommended Control Techniques

Any control method employed in isolation usually does not provide long-term control. An integrated system, using two or more options, provides more efficient and stable control of a weed with fewer undesirable side effects (NSW Agriculture 2001). In addition, integrated control of a weed species provides a cost-effective and practical solution to weed control.

An example of an integrated control plan for an individual weed may be as follows:

- Physically remove (by machine or hand) large and easily accessible areas of the weed;
- Chemical treatment (spot treatments) of any remaining plants;
- Plant suitable and diverse range of endemic species;
- Mulch remaining area with black plastic and thick layer of straw;
- Follow-up treatments (removal or poisoning of weeds, fertilising and watering of plantings) for a minimum of 2 to 3 years.

The combination of a number of integrated control options for individual weeds will determine the overall weed management plan for the subject area.

3.0 Possible Management Plans for Individual Weeds Identified on the Site

A number of weed species were identified on the site during the site visit on 14 March 2002. The main species included: Lantana, Moth vine, Common morning glory, Crofton weed, Farmers friend, Wandering jew and Black wattle. A number of other weed species, mainly annuals, were identified on the site but were in minor infestation levels. A description of each of the major weeds and possible control methods are provided in Appendix 1.

The study area can be divided into two broad areas: The Grotto and Greys Beach.

3.1 The Grotto

Vegetation found in the area known as 'The Grotto' includes good quality rainforest, bushland, wetland and the remnants of an historic market garden. The landscape in this area also contains a number of caves. These caves, in conjunction with the existing vegetation and their locality next to the Shoalhaven River, provide excellent habitat for a number of flora and fauna species in the region.

The main weed problems identified at the time of the site inspection were the presence of lantana and a number of vine species (e.g. moth vine), both of which can smother native vegetation. A number of other weeds, primarily annual and perennial weeds, (e.g. crofton weed) were also located in the area but were not considered the main weed threat at this time.

Given that a number of weed species were identified in the area and the relative good quality habitat, the following actions for weed control to allow natural regeneration of the area should occur.

1. **Inform community** Dispatch information leaflets to neighbouring residents and erect informative signs in the area regarding the wildlife habitat and social qualities of the vegetation in 'The Grotto'. Explanations of the strategy for controlling weeds to protect and enhance this area should be included (e.g. signage may include tips such as keeping to walking tracks and put litter in bins provided to protect and enhance flora and fauna habitat).
2. **Hand removal** Hand remove (with the assistance of Landcare or Green Corp teams, if possible) any easily accessible areas of weeds, such as lantana, and dispose of fragments appropriately (e.g. dry plant material or compost, monitor until complete death has occurred). For vine weeds (e.g. moth vine), stems may be cut at shoulder height and plant material in the canopy can be left to die. The bottom half of vine weeds including roots should be removed and disposed of. For some vine weeds (e.g. Madeira vine), this method will only exacerbate the problem. Care must be taken to correctly identify each weed species to allow for the correct control option to be followed. Note: mechanical methods may be implemented in this step, but care must be taken to avoid disturbing seedlings of native species that may have become established amongst weeds.

3. **Chemical Control** Treat remaining plants with spot applications with suitable herbicide. For example, apply a foliar application of Roundup® Biactive along river bank to control lantana, morning glory and crofton weed. For moth vine, cut and paint stem with glyphosate based herbicide.
4. **Mulching** In areas of social interest (e.g. lookout platforms, around the historic market garden), use weed matting and/or thick layer of straw to help suppress weed seeds in these areas.
5. **Rehabilitation/Revegetation** Where desired, local plant species should be encourage to regenerate. If this does not occur, plant suitable locally native trees, shrubs and ground covers (preferably from seed obtained from the Grotto area) to provide shade and competition against weeds. Ensure a number of species are used to provide diversity to the area. For the wetland area, plantings should include suitable locally native wetland species.
6. **Maintenance** Repeat from item 2 as necessary.

As with all weed management plans, the whole area often cannot be targeted at the same time. Smaller, more manageable areas within 'The Grotto' should be identified and targeted systematically. In general, areas with slight to moderate weed infestations are targeted first rather than areas with large weed infestations. The reasoning behind this method is to make areas resistant to weed invasion prior to large infestations taking hold. In addition, areas with existing large infestations often require a systematic method to slowly reduce the problem, rather than tackling the whole infestation at one time. This method of systematic implementation on control methods to selected areas also allows for different techniques to be tested to determine which method(s) are most suitable for the area.

Care should be taken during all weed control practices to ensure weeds are not introduced to the site. Adequate hygiene measures such as cleaning vehicles prior to and after entry to the site should be carried out.

In carrying out the above actions, Council should also encourage local Bushcare groups to contribute to the weed management program in the area, where appropriate.

3.2 Grey's Beach

The area surrounding Grey's beach is relatively clear of any weed infestation at the time of the site inspection. As this area is generally clear of weeds, the weed management plan aims for weed eradication for maintenance. A general weed management plan would be to regularly monitor (e.g. monthly or bimonthly) the area and identify weeds early. Spot applications of herbicides or removal techniques should then be implemented as required. General maintenance procedures such as mowing could also keep a number of weed species under control.

An infestation of lantana was identified near the entry to Grey's Beach. This infestation should be controlled by mechanical or hand removal techniques with follow-up spot treatments with glyphosate (Appendix 1). Lantana was also located along the riverbank and should be removed by hand.

This type of approach would enable weeds to be contained prior to large infestations occurring. To enhance the visual quality of the Grey's Beach area, plantings and landscaping may be implemented. Care should be taken during these procedures to ensure weed species are not introduced to the area (e.g. cleaning of mowing equipment prior to and after entry to the site). Plantings should contain a variety of locally native trees, shrubs and groundcovers that will not only compete with weeds species but also provide diversity to local fauna when mature.

As with The Grotto, Council should encourage local Bushcare groups to contribute to weed management at Greys Beach, where appropriate.

4.0 Identification of weeds

To confirm identification of weed species, assistance should be sought from organisations such as:

NSW Agriculture

web page: <http://farer.agric.nsw.gov.au/ap/weeds/index.html>

Regional Headquarters: NSW Government Offices
159 Auburn St
Goulburn, NSW 2580
(PO Box 389,
Goulburn NSW 2580)
Telephone: 4828 6600
Fax: 4828 3261

The Weed Society of NSW

web page: <http://nb.au.com/nswweedsoc>

Postal address: PO Box 438
Wahroonga NSW 2076

President: Bob Trounce
NSW Agriculture – Orange
email: bob.trounce@agric.nsw.gov.au
Telephone: 6391 3814
Fax: 6391 3883

Weeds Australia

web page: www.weeds.org.au

5.0 A note on Black wattle

The Black wattle is an Australian native species that has become naturalised in some areas around Australia. As a result, this species has become a weed in a number of areas. The control of this weed can be through the use of herbicide injected into the trunk, felling and painting with herbicide or complete removal. However, as with a number of tree weeds, this species may be providing important habitat for a number of local fauna. In addition, this tree could be providing soil stabilisation. Careful consideration of these factors should be taken in determining if this species is causing a dominant threat to the area and requires control.

Appendix 1: Weed profiles for selected weeds and control techniques

FAMILY: VERBANACEAE

COMMON NAME: Lantana

SCIENTIFIC NAME: *Lantana camara*

ORIGIN: Tropical South America

HABITAT: Widespread, especially in disturbed environments, rainforest, sclerophyll forest, moist gullies

Habit: shrub – scrambling shrub

Height: usually up to 3 m but can climb much higher

LEAVES:

Length: 2.5 to 8 cm

Width: 1.5 to 4.5 cm

Shape: ovate, apex acute to obtuse

Margin: toothed

Colour: mid-green

Arrangement: opposite

Type: simple

Other: upper surface rough, scabrous, lower surface usually pubescent

STEM: usually 4-angled, stem and branches long and weak with short recurved prickles and usually hairy

FLOWERS

Season: most of the year

Size: 4 – 6 mm diameter

Number of Petals: 4 to 5

Inflorescence: axillary, many-flowered umbel (2 to 3 cm diameter)

Colour: various combinations of white, orange, yellow, pink or red

Other:

FRUIT

Type: succulent drupe

Colour: black

Size: 4 to 6 mm

Season: most of year

SEED

Size: 1 or 2 seed per fruit

Viability: 1 to 2 seasons

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type: extensive shallow root system

Regrowth Ability: suckers from roots; layers; cut stems can reshoot if in contact with moist ground

DISPERSAL MECHANISMS: birds, vegetative, foxes, rubbish-dumping, water

REMOVAL TECHNIQUES:

cut, scrap and paint glyphosate (1:1.5); removal of plant; brush-hook/lopper or slash with tractor, mulch and spray regrowth with glyphosate (1:100)

Best Season: when actively growing

Other: Introduced as a hedge plant, numerous cultivars are grown as garden plants; some forms are toxic to stock if eaten; a declared noxious weed in NSW; can provide habitat for ground-dwelling fauna.

FAMILY: ASCLEPIADACEAE

COMMON NAME: Moth Vine

SCIENTIFIC NAME: *Araujia sericifera*

ORIGIN: Peru

HABITAT: Grows best in partial shade and moist situations. Grows well in riverine rainforest and other riparian vegetation

Habit: vigorous woody climber

Height: unrestricted

LEAVES:

Length: 3 to 11 cm

Width: 1.5 to 6 cm

Shape: usually triangular to ovate or oblong

Margin: entire, undulate

ovate, apex acuminate, mucronate

Colour: upper green, whitish below

Arrangement: opposite

(glaucous) with dense minute hairs

Type: simple

Other: base truncate to slightly cordate, 1 to 5 glands, apex twisted

STEM: twining and woody, copious white latex from cut stems

FLOWERS

Season: spring-summer

Size: 2 to 2.5 cm

Number of Petals: 5 tubular

Inflorescence: 2 to 5 flowered

Colour: white or pale pink

Other: highly fragrant

FRUIT

Type: pear-shaped follicle

Colour: pale glaucous-green

Size: 6 to 10 cm long, 6 to 7 cm wide

Season: summer-autumn

SEED

Size: 4 mm long, brown pappus

Viability: unknown

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type: shallow tap and lateral

Regrowth Ability: seedling rate high

DISPERSAL MECHANISMS: wind, rubbish dumping and water

REMOVAL TECHNIQUES: fairly resistant to herbicides when mature although cut, scape and paint is usually effective, hand pulling is most reliable especially seedlings, cut at head height, spray seedlings with glyphosate (1:50) plus acidifier (LI 700®; 0.5%), bag fruit if practical.

Best Season: when not stressed

Other: Is a declared noxious weed for some areas of NSW

FAMILY: CONVOLVULACEAE

COMMON NAME: Morning Glory

SCIENTIFIC NAME: *Ipomoea purpurea* or *Ipomoea indica*

ORIGIN: Native of tropical regions

HABITAT: Coastal districts, prefers moist areas, rainforest edges and disturbed areas

Habit: annual or perennial with twining stems

Height: unrestricted

LEAVES:

Length: up to 17 cm

Width: up to 15 cm

Shape: ovate to broad ovate

Margin: entire or 3-lobed

Colour: mid-green with paler reverse

Arrangement: alternate

Type: simple

Other: base cordate

STEM: grey-green with raised lenticels, pilose, milky latex with onion smell

FLOWERS

Season: throughout year

Size: tube to 7.5 cm long, 8cm diameter

Number of Petals: 5-fused

Inflorescence: axillary, 2 to many flowered

Colour: purplish blue or violet-blue

Other: funnel shaped

FRUIT

Type: capsule

Colour: brown

Size: 8 – 10 diameter

Season: throughout year

SEED

Size: approximately 1 mm

Viability: unknown

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type: tap root with long running stolons

Regrowth Ability:

DISPERSAL MECHANISMS: locally spread, rubbish dumping, water, vegetative

REMOVAL TECHNIQUES: cut, scrap and paint main stem with glyphosate (1:1.5), hand pull long running stolons, roll up and allow to dry out by suspending above the ground; mature plants relatively resistant to herbicide but can spray seedling with glyphosate (1:50) plus acidifier (LI 700®)

Best Season: when plant is not stressed

Other: cultivated as an ornamental, garden escape

FAMILY: COMMELINACEAE

COMMON NAME: Wandering Jew

SCIENTIFIC NAME: *Tradescantia fluminensis* (*T. albiflora*)

ORIGIN: South America

HABITAT: deep shaded areas to full sun. Prefers moist, semi-shaded areas, rainforest floor and gaps, gullies, creek banks, storm water drains etc.

Habit: ground cover which scrambles over small plants

Height: up to 60 cm (much higher when scrambling)

LEAVES:

Length: 2.5 to 5.5 cm

Width: 1 to 2.5 cm

Shape: ovate-lanceolate

Margin: entire

Colour: green, glossy, fleshy

Arrangement: alternate

Type: simple

Other: sheath 5 to 8 mm long

STEM: green, brittle and fleshy, branching, rooting at the nodes, prostrate

FLOWERS

Season: spring to summer

Size: 1 to 1.5 cm

Number of Petals: 3

Inflorescence: terminal cluster (15 to 20 flowers)

Colour: white

Other:

FRUIT

Type: papery capsule

Colour:

Size: small

Season: chiefly autumn – winter

SEED sets seed irregularly – need high light levels

Size: unknown

Viability: unknown

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type: fibrous roots

Regrowth Ability: stolons layer and roots form easily from nodes on stolons

DISPERSAL MECHANISMS: water (floods), dumping, disturbance (e.g. brush turkeys, trampling).

REMOVAL TECHNIQUES: spray with glyphosate (1:50) plus acidifier (LI 700[®]; 0.5%) with regular follow-up treatments, hand removal (regular follow-up required)

Best Season: autumn – winter (spraying)

Other: Garden escape, invasive weed, difficult to eradicate due to ability to regrow from rooted stems

FAMILY: ASTERACEAE

COMMON NAME: Crofton weed

SCIENTIFIC NAME: *Ageratina adenophora*

ORIGIN: Central America

HABITAT: disturbed moist sites on fertile soils

Habit: erect, branched perennial herb

Height: 1 to 2 m

LEAVES:

Length: 4 to 12 cm

Width: 3 to 9 cm

Shape: triangular to rhombic, apex acute to acuminate

Margin: crenate to toothed

Colour: dark green

Arrangement: opposite

Type: simple

Other: slightly hairy or glabrous, veins prominent and hairy

STEM: reddish brown and brittle

FLOWERS

Season: spring

Size: 5 to 8 mm

Number of Petals:

Inflorescence: terminal, campanulate, dense panicle

Colour: white

Other:

FRUIT

Type: achene

Colour:

Size: 1 to 2 mm long

Season: spring

SEED

Size: very small

Viability: unknown

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type: short root stock, weak lateral roots

Regrowth Ability:

DISPERSAL MECHANISMS: wind and water

REMOVAL TECHNIQUES: spray with glyphosate (1:100), if plants stressed (1:50) plus acidifier (LI 700[®]; 0.5%), hand-pull, make sure roots dry out

Best Season: throughout year

Other: declared noxious weed in many shires including Shoalhaven (W2), suspected of poisoning stock

FAMILY: ASTERACEAE

COMMON NAME: Cobblers pegs

SCIENTIFIC NAME: *Bidens pilosa*

ORIGIN: South America

HABITAT: moist sites, disturbed sites

Habit: woody herb

Height: 1 m

LEAVES:

Length: 6 to 8.5 cm

Width: 4 to 7 cm

Shape: lanceolate to ovate

Margin: toothed

Colour:

Arrangement: opposite

Type: simple or 3 to 5 lobed

Other: petiole distinctly lobed

STEM:

FLOWERS

Season: throughout year

Size:

Number of Petals:

Inflorescence: terminal, loose cymes

Colour: ray florets – white; disk florets – yellow

Other:

FRUIT

Type: achene

Colour: dark brown

Size: 5 to 12 mm long

Season: throughout year

SEED

Size:

Viability: unknown

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type:

Regrowth Ability:

DISPERSAL MECHANISMS: wind, animals

REMOVAL TECHNIQUES: spray (glyphosate), hand removal

Best Season: all year

Other: fruit is a barbed achene which attaches easily to clothing and animal fur

FAMILY: MIMOSOIDEAE

COMMON NAME: Black Wattle

SCIENTIFIC NAME: *Acacia decurrens*

ORIGIN: Australia

HABITAT: Grows in dry sclerophyll forest and woodland, often on river banks or rises

Habit: tree

Height: 5 to 15 m

LEAVES:

Length: 7 to 12 cm

Width: approximately 5 cm

Shape: pinnules linear to oblong

Margin: entire

Colour: green

Arrangement:

Type: compound (bipinnate)

Other: jugary glands present, interjugary glands absent

STEM: bark smooth, brown, branchlets angled or flattened, pruinose, sometimes hairy

FLOWERS

Season: July to December

Size: 6 to 10 cm

Number of Petals:

Inflorescence: globose

Colour: golden yellow

Other: heads are 21 to 30-flowered

FRUIT

Type: pod

Colour: dark brown to black

Size: 5 to 10 cm

Season: July to December

SEED

Size:

Viability: 5 years plus

ROOT SYSTEM/UNDERGROUND STRUCTURE

Type:

Regrowth Ability: nil

DISPERSAL MECHANISMS: birds, mammals and ants

REMOVAL TECHNIQUES: Herbicides suitable for woody weeds (trunk injection), felling/removal

Best Season:

Other: Native Australian species which has become an environmental weed in areas

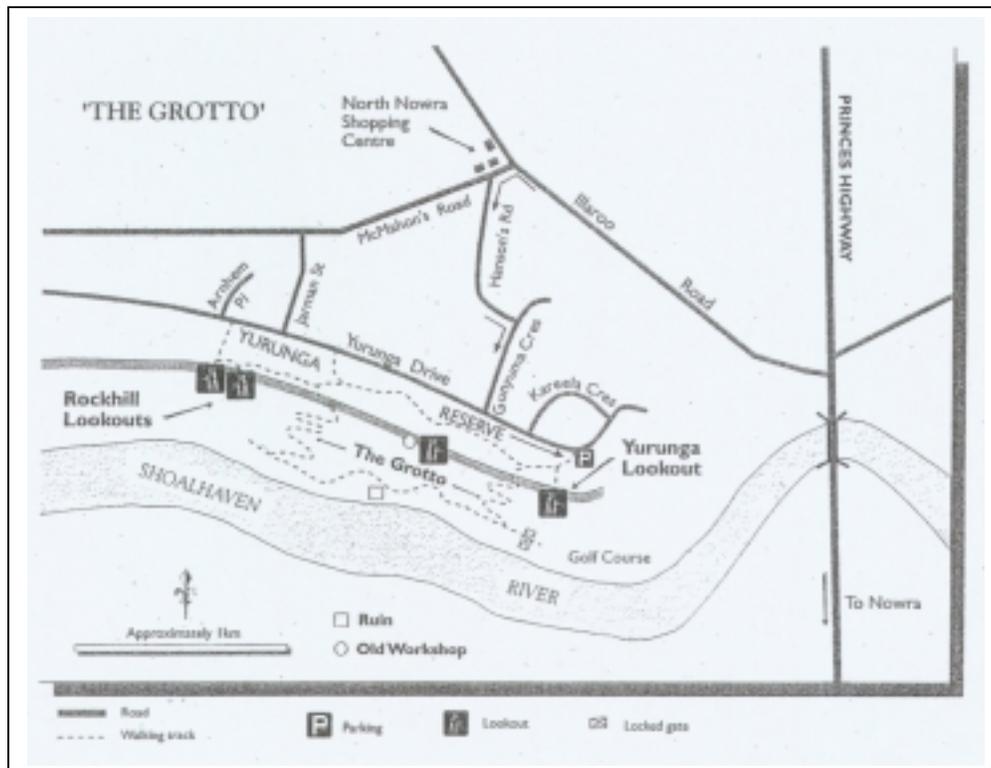
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Location of Interpretive Attractions in The Grotto

Locations of Interpretive Attractions in The Grotto

Interpretive Attraction	Locational Details	Photo/Location Plan
<p>1. Indigenous Heritage Escarpment cave used by local Aboriginal man</p>	<p>In the escarpment behind the second tee and third green on the Nowra Golf Course.</p>	<p>No photo provided to protect precise location of the cave. Signing of the site should be done in consultation with the Local Aboriginal Land Council.</p>
<p>2. Natural Environment and Heritage Rock representative of local geology</p>	<p>East of The Grotto picnic area at the bottom of the escarpment.</p>	
<p>3. Natural Environment and Heritage River access point with information about local river processes</p>	<p>Near picnic area in The Grotto.</p>	
<p>4. European Heritage Market garden site</p>	<p>Centrally located in The Grotto picnic area.</p>	

Interpretive Attraction	Locational Details	Photo/Location Plan
5. Natural Environment and Heritage Cave site	In the escarpment behind The Grotto picnic area.	
6. Natural Environment and Heritage Endemic vegetation	Western edge of The Grotto picnic area.	Multiple areas exist at the Western end of the picnic area.
7. European Heritage Cave workshop used by residents of homestead	In the escarpment approximately 300m west of The Grotto picnic area. Precise location should be determined in consultation with the local historical society.	See map below.
8. European Heritage Homestead site and water tank run	Approximately 350m west of The Grotto picnic area. The homestead ruins are obscured by vegetation regrowth. Precise location should be determined in consultation with the local historical society.	See map below.



<p>9. European Heritage Wharf Site</p>	<p>Approximately 750m west of The Grotto picnic area.</p>	
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Legislation and Policy Summary

LEGISLATION & POLICY SUMMARY

The management of Greys Beach and The Grotto Land requires compliance with existing government legislation & policy. In addition to the Local Government Act 1993 and the Crown Lands Act 1989, the main aspects of current legislation and policy listed in the Plan include:

NSW Environmental Planning & Assessment Act 1979

The EP&A Act has the following objectives:

- to encourage the proper management, development and conservation of natural resources for the purpose of promoting the social and economic welfare of the community and a better environment.
- the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats.

Zoning

Any land use proposed for an area must be consistent with the zoning that is applied to the land by Council's Local Environment Plan.

Environmental assessment

Environment Assessment must be carried out for any proposed activity or development. Any change in the use of a reserve area requires a development application (DA) and environmental assessment of the proposed activity under Part 4 of the EP&A Act forms part of the DA. A review of environmental Factors (REF) under Part 5 of the EP&A Act must also be written for those proposed activities which do not require development consent.

Protection of Environment Operations Act 1997

This legislation replaces the Clean Air Act 1961, Clean Waters Act 1970, Pollution Control Act 1970, Noise Control Act 1975, and the Environmental Offences and Penalties Act 1989. It is an offence for a person to discharge pollutants to waters unless they hold an environment protection licence.

State Environmental Planning Policy No. 71 – Coastal Protection

State of Environment Planning Policy No. 71 – Coastal Protection (SEPP 71) Commenced in November 2002. SEPP 71 has been made under the Environmental Planning and Assessment Act 1979 and will ensure that the coastal zone is protected in accordance with the principles of ecological sustainable development.

SEPP 71 makes the Minister for Planning the consent authority for major high-risk development proposals in the coastal zone as defined by the Coastal Protection Act 1979. SEPP 71 also define a category and development assessment process for development in sensitive coastal locations, which are:

- a coastal lake (a list of coastal lakes appears in schedule 1 of SEPP);
- within 100m above mean high water mark of sea, a bay or an estuary;

- land within 100m of the water's edge of a coastal lake, a declared Ramsar wetland, a World Heritage property, an aquatic reserve, a marine park, a national park, a nature reserve, or SEPP 14 – Coastal Wetland; or
- Residential land within 100m of land identified under SEPP 26 – Littoral Rainforest.

Commonwealth Native Title Act 1993

As a result of the High Court Mabo Decision the Commonwealth Government enacted legislation which recognised the interest that indigenous Australian may still hold in some areas of Crown Land. The Act makes provision for:

- Aboriginal and Torres Strait Islanders to lodge native title claims;
- the determination and validation of extinguishment of native title;
- The dealing with land and waters where native title may not have been extinguished; and
- Establishing the existence of native title.

The requirements of this legislation must be followed by reserve trust's when dealing with Crown reserve where it has not been establishment that any native title interest that may have existed in the land has been lawfully extinguished.

The Fisheries Management Act, 1994

Under Section 205 of the Act, the Minister's consent is required for any cutting, removal, damage or destruction of mangroves, seagrasses or any other prescribed marine vegetation on public land.

Native Vegetation Conservation Act 1997

This Act replaces SEPP 46 and incorporates native vegetation clearing controls previously contained in SEPP 46, the Soil Conservation Act 1938, the Western Lands Act 1901, the Crown Lands (Continued Tenures) Act 1989 and the Forestry Act 1916.

The Act provides for the development of Regional Vegetation Management Plans by community based Regional Vegetation Committees. Among other things, the plan will highlight areas where the condition of native vegetation should be improved and recommend areas that should be revegetated.

Section 7 provides that a person shall not ringbark, cut down, poison, top lop, remove, injure or otherwise destroy any tree or cause such to be done on any protected land in or within 20 metres of the bed or bank of any part of a river, stream, lake, lagoon or swamp, etc, without prior approval from the Department of Lands.

Protected lands which are identified as prescribed streams in the Shoalhaven are:

- Clyde River and 8 tributaries
- Coonemia Creek
- Croobyar Creek

- Crookhaven River
- Currumbene Creek
- Parma creek
- Shoalhaven River and 28 tributaries including
- Kangaroo river
- Brogers Creek
- Broughton Creek
- Yalwal Creek
- Wandandian Creek

Threatened Species Conservation Act 1995

The objectives of this Act are:

- a) To conserve biological diversity and promote ecologically sustainable development.
- b) To prevent the extinction and promote the recovery of threatened species, populations and ecological communities
- c) To protect the critical habitat of those threatened species, populations and ecological communities that are endangered
- d) To eliminate or manage certain processes that threaten the survival of evolutionary development of threatened species, populations and ecological communities.
- e) To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.
- f) To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

Species Impact Assessments must be written for all proposed new work that is 'likely to significantly affect threatened species, populations or ecological communities or their habitats'.

Rural Fires Act 1997

Section 63(1) states:

"It is the duty of a Public Authority to take the notified steps (if any) and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the spread of a bush fire on or from:

- (a) any land vested in or under its control or management, or
- (b) any highway, road, street, land or thoroughfare, the maintenance of which is charged to the authority."

One of the objects of the Rural Fire Act is to provide "for the protection of the environment by requiring certain activities to be carried out having regard to the priorities of ecologically sustainable development described in Section 6(2) of the Protect of Environment Administration Act 1991"

Water Management Act 2000

The objects of this Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:

- (a) to apply the principles of ecologically sustainable development, and
- (b) to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and
- (c) to recognise and foster the sufficient social and economic benefits to the State that result from the sustainable and efficient use of water, including:
 - (i) benefits to the environment, and
 - (ii) benefits to urban communities, agriculture, fisheries, industry and recreation, and
 - (iii) benefits to culture and heritage, and
 - (iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of the land and water,
- (d) to recognise the role of the community, as a partner with the government, in resolving issues relating to the management of water sources
- (e) to provide for the orderly, efficient and equitable sharing of water from water sources,
- (f) to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna
- (g) to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,
- (h) to encourage best practice in the management and use of water

Part 3A Protection of Rivers and Lakes (covered under Rivers and Foreshores Improvement Act 1948)

Protected land – the bank, bed or shore of protected waters; note more that 40m from top of the bank or shore of protected waters; material deposited on or under the above mentioned land.

Protected waters – a river, lake (assoc. with river), coastal lake or lagoon (include. any permanent/temp. channel between a coastal lake or lagoon & the sea).

A permit is required to excavate on, in, under protected land; remove material from protected land; do anything which obstructs/detrimentally affects flow of protected waters (or is likely to do so).

This does not apply to Council. However if the Constructing Authority believes that work conducted by/for Council has

- (a) damaged or detrimentally affected or is likely to damage or detrimentally affect protected land, or
- (b) caused or is likely to cause, whether directly or indirectly, protected waters to contain their course

then they may require Council to undertake specified works in a specified time.

Environment Protection and Biodiversity Conservation Act 1999

This Act provides protection for matters which are considered to be of national environmental significance (NES). Specifically:

- World Heritage properties
- RAMSAR wetlands
- Nationally threatened species and communities
- Internationally protected migratory species
- Commonwealth areas
- Nuclear actions

The EPBC Act establishes a new legislative framework to protect and conserve nationally important aspects of the environment and to conserve biodiversity.

The Act is triggered only if there is a direct action (on-ground) involved, if there is an effect on an NES matter and if the impact is significant.

Should the Act be triggered, all State Government approvals are firstly required before the matter is referred to the Federal Government for final approval.

NSW Rivers and Estuary Policy

The objective of the policy is "to manage the rivers, estuaries and adjacent wetlands of NSW in ways which:

- slow, halt or reverse the overall rate of degradation in their systems;
- ensure the long-term sustainability of their essential biophysical functions, and
- maintain the beneficial use of these resources" (NSW Government, 1992).

The policy contains a set of management principles to achieve the objective of the policy. The policy also contains several sub-policies including the State Wetlands Policy. Recommendations of this assessment and future use and management of the study area and its watercourses and wetlands would need to be consistent with this policy.

River and Foreshores Improvement Act, 1948

This Act makes provision for the protection and improvement of protected waters (i.e., watercourse as defined in the Act) and the associated beds, banks, shores and land within 40 metres of these waters. Any works within 40 metres of protected waters need to be referred to DLWC to determine where the works require a permit under Part 3A of the Act

Food and Beverage Outlets on Crown Reserves Policy

The policy addresses the need to maintain the integrity of the special nature of public purpose reserves, a consistent approach to the establishment of these facilities across the state. The policy delineates which food and beverage outlets are suitable and which food and beverage outlets may not be suitable.

Shoalhaven City Council Recreation Strategy (1999)

Council adopted a Recreation Strategy in late 1999 which aims to

“Improve the quality of life in the Shoalhaven by creating a diversity of recreation opportunities whilst protecting and enhancing the natural and built environment”

The Recreation Strategy identifies a range of actions to meet this goal, based on the following:

The provision of recreation facilities, programs and services is to:

- (a) be based upon an assessment of current and future needs.
- (b) be realistic in terms of Council's (and the community's) ability to operate and maintain them.
- (c) ensure the achievement of equity of opportunity for all individuals and groups within the city, regardless of age, ability, ethnicity or economic capacity.
- (d) avoid unnecessary duplication of opportunities.
- (e) be based upon efficiency, quality and continuous improvement principles and approaches.
- (f) be based upon meaningful community consultation.
- (g) incorporate resource sustainability practices and principles.
- (h) incorporate best practice risk management processes to reduce public risk.
- (i) include the encouragement and support of community and commercial initiatives in the provision and management of recreation opportunities.