FACT SHEET 7

WEEDS AND METHODS OF CONTROL

The project included all remnant bushland occurring on Bundanon Trust properties. As indicated within the Land Management Plan there was approximately; 168 hectares of high density weed infestation, 28.3 hectares of moderately dense weed infestation, and 18.7 hectares of low density weed infestation across 862 hectares of Bundanon Trust properties and 180 hectares of leased Crown Lands, prior to the project.

Image: View through high Lantana thickets

OTHER PROBLEM WEEDS ON THE BUNDANON PROPERTIES

The major weed infestations are comprised of the species; Lantana (*Lantana camara*), Blackberry (*Rubus fruticosa*), and Cassia (*Senna pendula var glabrate*). Minor weed infestation species of ecological significance include Moth Vine (*Araujia sericifera*), Bridal Creeper (*Asparagus asparagoides*), Cape Ivy (*Delairea odorata*), Fireweed (*Senecio madagascariensis*), Bathurst Burr (*Xanthium spinosum*), Madeira Vine (*Anredera cordifolia*), St.Johns Wort (*Hypericum perforatum*), Wandering Jew (*Tradescantia fluminensis*), Camphor Laurel (*Cinnamomum camphora*), Paddy's Lucerne (*Sida rhombifolia*) and Balloon Vine (*Cardiospermum grandiflorum*). This list is by no means exhaustive nor infers priority status with regard to control measures.

Blackberry

Fireweed

Cassia

Moth Vine

Wandering Jew

Wild Tobacco

The key to effective weed control is targeting weed species of significance where native vegetation exhibits good recovery potential and the containment of infestations where complete eradication is not easily achieved. A 10 year Weed Eradication Program involving a range of control methods (herbicide application, mechanical earthworks removal, and manual control; hand grubbing and cutting) was recommended. Eradication and control must be implemented in manageable stages and via integrating control methods, and followed up with revegetation works to ensure habitat recovery is achieved.

Control by fire is not recommended on the Bundanon Trust properties – risks to assets including potential negative impacts to native vegetation communities are too great unless controlled burns under very specific environmental conditions are undertaken. Landscape, topography, and vegetation community diversity do not favour the establishment of large firebreaks or backburning techniques without considerable public authority intervention.

EXOTIC WEED SPECIES CONTROL AND MANAGEMENT

The presence of exotic weed species established within agricultural grazing lands on Bundanon and Eearie Park such as fireweed, Black Nightshade Paddys Lucerne as well as Thistles, Fleabane and Cobblers Pegs is more a factor of pasture utilisation or lack of uniform grazing pressure across paddocks in question.

Livestock will always favour certain pasture species and sweet areas within a given paddock with resultant increased grazing pressure and reduced competition against colonising weed species. Wet summers also provided ideal conditions for weed species growth and subsequent seed production for the next ten years along the south coast.

Initial control of noxious weed species such as fireweed and St John's Wort should be undertaken using chemical control methods. The spraying of herbicide using foliar application via hand gun or boom spraying (for large infestations) is recommended to be implemented when plants are actively growing and up to flowering stage.

Monitoring of sprayed weeds is required as follow up chemical control may be necessary. Long term management is to ensure re-establishment of pasture grasses and herbage and maintenance of competitive ground cover.

Management of other weed species such as Bathurst Burr, Paddys Lucerne, Thistles, Fleabane, and Cobblers Pegs is to slash plants prior to flowering and maintain competitive pastures. Time control grazing management will ensure adequate regrowth of grasses, herbage, and pulse species with rest periods, and uniform grazing of paddocks (via increased stocking rates) thereby maintaining competitive ground cover, and essential biodiversity values. The constant monitoring of plant growth, density of individual species, and plant diversity allows the farm manager to judge feed availability as well as pasture utilization.

Image: Thistle sprayed with herbicide in bush regeneration area.

Image: Distinguishing between native and invasive weeds species in regeneration areas is a vey important skill.

Image: Constant vigilance is required to maintain bush regenration efforts, such as this hard to access creekside area at Riversdale where lantana is climbing a eucalyptus species to gain more sunlight for growth

WEED CONTROL METHODS ACCORDING TO INFESTATION TYPE

Integrated woody weed control combines two or more methods targeting vulnerable aspects of the weed species, different points in its life cycle or its environment in order to achieve more effective control. In most situations, woody weeds can be controlled successfully through integrated control together with sustained follow-up and revegetation works. Lantana, Blackberry and Cassia can often be managed easily if control efforts are kept up. The type of control methods depend on; the size of the infested area, whether the infestations are dense or scattered, and the available resources.

Large, dense infestations of woody weeds

Treatment with herbicides alone is not usually economically feasible. Large infestations often require initial treatment such as mechanical removal using a small excavator and slashing with tractor to reduce height and density, create access, and generate regrowth, which can then be more easily and economically treated with follow-up foliar applications of herbicide using either tractor, 4WD utility, or an all-terrain vehicle with tanks and handguns.

Small, dense infestations of woody weeds

Small, dense infestations can be treated cost effectively by foliar spraying of herbicides using tractor, 4WD utility, or an all-terrain vehicle. Using splatter guns and hand guns with retractable hoses to apply concentrated herbicide solutions is also appropriate for smaller areas as they minimise off-target damage (spray drift) to surrounding native vegetation and grasses/herbs/legumes.

Small, scattered infestations

Low-volume applications of herbicides, such as the cut stump method and basal bark spraying, are effective on small, scattered infestations; but access to the stems will depend on the size and density of the thickets. Mechanical grubbing can be feasible in small infestations where complete removal of stumps and roots is achievable. Mechanical grubbing (use of a small machine with a bucket to selectively push or pull out plants) of individual plants generally causes less soil disturbance than using a machine (excavator used to push up large areas) however in all cases exposed soils must be re-sown with a cover crop (rye/corn/millet) prior to follow-up revegetation works. Also feasible are manual control methods, such as hand grubbing and hand pulling of young seedlings; and the cut, scrape and paint method of herbicide application that requires more effort than the cut stump method, but is often more effective.

Images: Large Lantana infestations at Bundanon prior to the Living Landscape project

METHODS OF CONTROL

Manual control methods

Manual control methods minimise disturbance to soil and native vegetation, lowering the risk of both erosion and the further germination of woody weed species. Teams of three or four experienced workers can gain access to areas that machinery and vehicles cannot and remove lantana and other woody species. Sturdy gloves, a long sleeved shirt, long pants, and eye protection should be worn to avoid scratches, insect bites, allergies and eye injuries.

Hand Grubbing
Hand grubbing is useful for small-scale infestations; larger infestations will require a team of workers. A mattock, chip hoe or lever is used to remove whole plants, including their root system, from the ground.

Hand Cutting
Hand cutting with a powered brush-cutter and/or small chainsaw can create access into heavy infestations for carrying out other control. Hand-held brush hooks, machetes or cane knives can also be used. Another method of hand cutting is to use strong secateurs to cut lantana stems into small pieces. When the main, thicker stems or basal stem are reached, the plant can be grubbed out or cut and painted with herbicide (the cut stump method). The cut stems can serve as mulch for revegetation works, but careful monitoring for regrowth and seedlings is necessary.

Hand Pulling
Hand pulling seedlings and their roots is often useful as a follow-up treatment. It is most effective after rain when the soil is moist. A team of workers can successfully hand pull whole mature lantana plants by the main stems after the root stump has been grubbed out, then haul it away to a burn pile.

Chemical control methods

Foliar spraying

Foliar spraying refers to high volume application of herbicide solution using a hand gun to treat the foliage of woody weeds. The entire leaf area of plants is treated to the point of run-off, with thorough coverage of the crown, runners and tips. There are a number of ways of carrying out foliar spraying depending on the size and height of infestation and available equipment. Workers wearing knapsack spray units can treat smaller and less accessible infestations. Spot spraying is the foliar spraying of individual plants or small infestations using a knapsack spray unit or a hose and hand gun. Splatter guns can also be used for applying larger droplets of herbicide mixture at higher concentrations than other foliar applications. They are effective mostly for young regrowth lantana between 30cm and 1m in height. An example of the use of foliar spraying methods is demonstrated in the following photos at the location

Images top to bottom: Property staff member hand cutting near Riversdale Creek using a brushcutter; Property staff member hand pulling a young lantana plant; with chemcial control using a cut and paste method, the application of herbicide needs to be immediate, otherwise the plant seals its cells. Weather conditions need to be assessed and monitored throughout the application of foliar spraying to reduce risk of drift, chemical run-off especially in riparian zones.

ABOUT CHEMICAL CONTROL METHODS

Control with chemicals (herbicides) is a practical, effective, and efficient component of a woody weed eradication program. Chemical use is very cost-effective for smaller infestations, and for treating regrowth, but less so for extensive infestations.

Many herbicides are registered for lantana and other woody weed control in NSW for different land use situations. The range of active ingredients contained in the various herbicide products registered for Lantana, Blackberry, Cassia, and other woody weeds includes; dichlorprop (Lantana DP600), fluroxypyr (Starane 200), triclopyr (Garlon 600), triclopyr and picloram (Grazon; Access), glyphosate (Roundup), metsulfuron-methyl (Brush-Off), 2,4-D (amine and ester – Tordon 75-D; Amicide 500), and tebuthiuron (Graslan), and certain combinations of these, at various rates and methods of application.

In Australia, the Australian Pesticides and Veterinary Medicines Authority controls and regulates the use of pesticides, including herbicides. It assesses chemical products for toxicity, efficacy, environmental impact, residues, and any implications for occupational health and safety. By law herbicides must only be used in accordance with label instructions or off-label permits.

Personal protective equipment (such as protective clothing, gloves, gumboots, eye protection and respiratory protection) must be used, also in accordance with the manufacturers' recommendations. Contractors engaged to implement woody weed control works are required by law to provide Chemcert Accreditation, public liability insurance, and workers compensation cover. Records of spraying applications must be presented to management on a daily basis including a Safe Methods Work Statement.

Recommendations of appropriate herbicide, rate, and application, for varying landscape zones will be further documented in final report post Rapid Site Assessments and Weed Infestation/Vegetation community assessments.

There are numerous forms of application techniques and equipment available to apply herbicides. Equipment includes boom sprayers, hand guns, knapsacks, wick-wipers, granular soil applicators, aerial sprayers and gas guns. Application methods include foliar spraying, basal bark and cut-stump application, stem injection and wick-wiping methods. The type of equipment and application method chosen for weed control depends on the size of infestation, type of weed, topography, access, potential environmental and health hazards, and susceptibility or suitability of a certain weed species to a particular application method.

For application equipment to operate effectively, the weather, soil conditions and time available for spraying must be considered. Suitable weather conditions are essential if herbicides are to be applied safely and effectively. Weather conditions should be assessed and monitored throughout the application period to reduce risk of drift, chemical run-off, and subsequent off-target damage to native flora and fauna.

Image: Foliar spraying unit mounted on a quad bike used by Living Landscape contractors Mountain Echo

LOW-VOLUME HERBICIDE APPLICATIONS

Basal bark spraying

This method can be used to treat saplings and regrowth less than 10cm in basal diameter. For basal bark spraying, an oil soluble herbicide is mixed with diesel and then sprayed at low pressure or painted with a brush around the circumference of stems, from the ground to a height of 30cm. For control to be effective, the full circumference of every stem growing up from ground level must be saturated. The herbicide solution should not be applied to wet or charred stems, as this prevents the herbicide from penetrating through the bark. Basal bark spraying is effective for large plants that cannot be accessed for foliar spraying application, and is effective at any time of year.

Cut stump method

Cut stump application is the preferred method for multi-stemmed woody weeds such as Lantana. Cut stems as close to ground as practical, no higher than 10-15cm from ground level, using either a chainsaw, hand saw, axe, brush-cutter or machete. This method is carried out effectively by two workers. Cut stumps must be treated with herbicide immediately after cut is made (within 15 seconds) either via knapsack, hand held spray bottle or drench gun, or painted onto cut stump using a brush. Scraping sides of cut stump and painting or spraying herbicide onto scraped area is also effective as a control method for difficult to access sites targeted for once-off seek and destroy actions (eg. riparian cliff slopes, steep banks and rocky tors). An example of a target zones for basal bark and/or cut stump herbicide applications include all Riparian and drainage line buffer zones. The following images show the riparian banks adjacent to the river edge at Bundanon beach.

There are various regulations and guides available to the user of the herbicides which includes information about:

- Suitable months for usage
- rate and volume of application per spraying area

Mountain Echo contractor demonstrating herbicide spraying of weeds in a revegetation area

Images below: cut and paste method demonstrated.

MECHANICAL CONTROL METHODS

Control with mechanical methods is suitable for extensive lantana infestations where access is practical and large thickets require removal to allow other integrated control methods to be implemented; including site rehabilitation. Mechanical removal of lantana with heavy machinery such as tractors and dozers causes high levels of soil disturbance, impact upon any existing native vegetation and increase germination rates of Lantana and other weed species and some native plant species. In some sites soil disturbance is required for regeneration of native plant species such as groundcovers and understorey colonisers, however in all cases soil conservation measures including constructed swales across slopes, sediment fences, and soil sediment ponds must be implemented for appropriate soil erosion control. Prior to undertaking mechanical removal of weed infestations the advice of the Southern Rivers Catchment Management Authority should be sought. Native vegetation is protected under the Native Vegetation Act 2003 and therefore the removal of native species during weed control works should be investigated.

Mechanical grubbing

Mechanical grubbing using a small Excavator removes entire Lantana plants and thickets from the ground with minimal soil disturbance. The advantage of using an excavator (with experienced operator) is the effectiveness of removing Lantana and other woody weeds completely from an infested site therefore allowing immediate rehabilitation of project site with native species. Earthworks mechanical removal is recommended for low to medium slopes (not greater than 15 degrees slope) within existing remnant bushland canopy zones, and cleared lands buffer edge along upper zone of riparian banks of Shoalhaven River.

Mechanical slashing

Slashing using a 4WD tractor with heavy duty slasher is effective for containing infestations around the margins of forest rim areas and infestations bordering cleared areas where practical access available. Slashing reduces the height and density of thickets to allow treatment of regrowth via foliar spraying and hand removal methods. Mechanical slashing is recommended for low slopes and open forest sites with available vehicle access, and low to medium density woody weed (Lantana) infestations – for example, on the Beweeree property.

Mechanical pushing/stick raking

Blade pushing and stick raking is suitable for large scale woody weed infestations across arable agricultural landscapes. Disturbance to soil is high with subsequent soil loss and erosion a risk with heavy rain events. A stick rake attachment on blade of dozer is more effective for mature plant and root removal and reduces soil disturbance and loss of topsoil. Mechanical pushing/stick raking effective for complete removal of woody weed infestation and immediate follow up site preparation for large scale revegetation works. This method was recommended for Haunted Point where dense Lantana infestation and regrowth wattle is further degrading historically cleared grazing and agricultural lands. Clearing of Lantana and senescent Black Wattle regrowth will also provide access to Lantana infested riparian zones of Shoalhaven River.

Image: Mechanical grubbing with excavator and after mechancial grubbing at Haunted Point

OTHER LANTANA CLEARING METHODS

The mowing down of lantana cane forms a mulch which helps to retain soil and prevent ersoion. Follow up spraying is necessary to stop regrowth of lantana and control other weed species.

Image: Riversdale creeklines bush regeneration, an example of a creek bank heavily infested with lantana. A swathe of lantana growth is cut down using a brush cutter to create access into the site. Lantana growth on the lower river bank remains to support fauna habitat. Uphill from the cleared corridor, lantana removal and replanting with native species is prioritised. The aim is to shade out opportunistic weeds and to exhaust the soil weed seed bank.

The Bradley Method

In areas with impenetrable Lantana thickets, the Bradley Method can be used. In the 1960s and 1970s Joan and Eileen Bradley developed a series of weed control and native vegetation recovery techniques through trial and error. Their work was the beginning of bush regeneration in New South Wales. The 'Bradley method' involved methodically clearing small areas in and around healthy native vegetation so that the each area was re-colonised by the regeneration of native plants, replacing the weeds.

The method places great emphasis on on rigorous and timely weed control follow up during the recovery phase (a tenet still adhered to in modern bush regeneration). The process showed that, once native vegetation was re-established, continuing weed control was needed infrequently, mainly in vulnerable spots such as creek banks, roadsides and clearings.

The Bradley Method follows three main principles,
- Secure the best areas first, as they are the easiest to work with the best results, then they can be expanded.
- Minimise disturbance to the natural conditions
- Don't overclear – let the regeneration of the bush set the pace of clearance

The essence of these principles guides modern bush regeneration, taking into account modern techniques and the need for appropriate ecological disturbance to trigger regeneration.