

## WEED MANAGEMENT PROGRAMS IN NEW SOUTH WALES NATIONAL PARKS

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**Summary** NSW National Parks and Wildlife Service is responsible for the management of over four million hectares of public land. Weeds are a major threat to the integrity of many of these areas, and infestations may also pose a threat to neighbours. A special funding package for pest management has been used to appoint and resource pest management officers in each of the 27 Districts. During 1995/96 the Service has undertaken over 200 weed control programs and this paper summarizes key programs on bitou bush, groundsel bush, Scotch broom, serrated tussock, rainforest weeds and bushland regeneration.

### INTRODUCTION

New South Wales has an extensive system of conservation areas such as national parks, nature reserves and wilderness areas with a total area of approximately 4.3 million ha. Under the National Parks and Wildlife Act the National Parks and Wildlife Service (NPWS) has a statutory responsibility for the management of these areas and for the protection and care of nature, and Aboriginal and historic heritage throughout New South Wales.

The Service aims to manage weed populations to reduce their adverse impacts rather than to attempt eradication, which in most cases is not feasible. Some areas have been so badly degraded prior to reservation that rehabilitation will be a slow and costly process. The methods used often reflect a balance between the desire to use the most effective control techniques (e.g. aerial application of glyphosate to control bitou bush) with a desire to minimize non-target effects.

Wherever possible integrated control programs are adopted using a range of methods. Biological control is incorporated into programs wherever effective biocontrol agents are available. However, in many cases biological control is a long-term option that at best will reduce the vigour of the target species. The Service is committed to a regional/catchment approach to weed control where the programs are undertaken in collaboration with neighbours, community groups, and local government councils.

### NEW DIRECTIONS

Funding for pest management on the Service's estate has increased from approximately \$A2 million in 1994/95 to \$A3.3 million in 1995/96 with a further increase

anticipated for 1996/97. Approximately half of this amount is spent on weed control programs. The Service has a structure comprising 27 Districts grouped in six Regions and the funds have been used to appoint and resource staff in each District with specific responsibilities for pest management (weeds and feral animals).

Each District has developed a weed management strategy as part of its overall pest management function. The objectives of the weed control programs are to:

- i. conserve biodiversity,
- ii. manage weed infestations to minimize spread out of, and onto, Service estate,
- iii. satisfy legislative responsibilities,
- iv. support a co-operative approach to weed management with other agencies and the community, and
- v. foster community support for the Service's weed management programs.

Humphries *et al.* (1991) have defined environmental weeds as those that cause major modification to species richness, abundance or ecosystem function. One of the major problems in planning management programs for environmental weeds is that there are no recognised criteria to easily assess their environmental impacts: existing information is mainly descriptive, being based on visual impacts and anecdotal accounts. The Service has developed a set of criteria which staff use to assist with prioritizing weed problems.

These criteria are listed below:

- a. Category W1 noxious weeds (e.g. parthenium weed, *Parthenium hysterophorus*).
- b. A weed which poses a significant threat to a population of an endangered or rare species (e.g. Madeira vine, *Anredera cordifolia*, threatens several endangered rainforest species).
- c. A weed which threatens the conservation or recreational values of an area (e.g. exotic vines, bitou bush, *Chrysanthemoides monilifera*, etc.).
- d. A weed that the community has identified as a high priority for action (this includes, but is not restricted to, weeds declared noxious under the Noxious Weeds Act) (e.g. serrated tussock, *Nassella trichotoma*, on the tablelands).
- e. A weed population of limited distribution, but known to be an important problem in other parks, or in other states or overseas (e.g. Mysore thorn, *Caesalpinia decapetala*, at the Lake Innes Nature Reserve).

- f. Location of a weed infestation within a water catchment (e.g. blackberries, *Rubus fruticosus* agg., in the upper catchments of a number of rivers).
- g. A weed for which continued management is necessary to maintain benefits gained from previous control programs (e.g. on-going program for groundsel bush, *Baccharis halimifolia*, in Yuraygir National Park).
- h. A weed for which a window of opportunity occurs (e.g. biological control of bitou bush).
- i. A weed which must be controlled/contained to allow another high priority management program to be effective (e.g. *lantana*, *Lantana camara*, infestation near historic site).

The Service's weed control programs involve a wide range of species including well known agricultural weeds such as serrated tussock, and blackberry, as well as species specific to conservation areas such as bitou bush, privet (*Ligustrum* spp.), Madeira vine, and bridal creeper (*Asparagus asparagoides*). Emerging weed problems such as Mysore thorn, Easter cassia (*Senna pendula*), black locust (*Robinia pseudoacacia*), and golden wreath wattle (*Acacia saligna*) are also being addressed.

#### KEY PROGRAMS

The remainder of the paper discusses some of the key weed management programs undertaken by District staff.

**Bitou bush** A co-operative program involving landholders, local community groups, NSW Agriculture and universities, is being undertaken to ensure an integrated approach to controlling bitou bush is adopted on Service lands. This includes release of biological control agents, when available, herbicides (by Service staff, contractors and volunteers) and, where possible, removal by hand.

The Service also allocates approximately \$A60 000 per year towards the national program on biological control of bitou bush. This program is coordinated by Standing Committee on Conservation's Task Force on Weeds of Conservation Areas. It includes research being undertaken overseas and in Australia by CSIRO Division of Entomology, the Victorian Department of Natural Resources and Environment, and NSW Agriculture.

The bitou tip moth (*Comostolopsis germana*) has now been released at over 50 sites in New South Wales, many of these on Service land (e.g. Sea Acres Nature Reserve and Yuraygir, Booti Booti, Wyrabalong and Botany Bay National Parks). Late last year the bitou tortoise beetle (*Cassida* sp.) was released at primary nursery sites at Botany Bay and Myall Lakes National Parks and it has established successfully at both sites. A third agent, the bitou seed fly (*Mesoclanis polana*), will be released in Yuraygir National Park sometime in late

winter 1996. In all cases Service staff are working closely with research scientists from the Weeds CRC to select the most appropriate sites and to assist with monitoring establishment of the agents and their impacts on bitou bush.

Although bitou bush is only declared a noxious weed in four local government areas outside of Sydney Service staff have developed, or are developing, management plans to control it on most of our parks and nature reserves. This usually involves the use of glyphosate applied as a cut-stump treatment (scattered plants in amongst native species), or as a foliar spray where monocultures prevail. The area infested with bitou bush has been reduced substantially in some parks and reserves (e.g. Broulee Island Nature Reserve) although in most cases the infestations are so widespread that a containment program combined with a progressive reduction plan is the only feasible management strategy (e.g. Yuraygir National Park).

The NPWS is also working closely with NSW Agriculture research scientists to evaluate the effectiveness of aerial applications of low rates of glyphosate (0.72 kg a.i. ha<sup>-1</sup>) for control of bitou bush. Research by these scientists shows that when applied at these rates during winter, glyphosate is very effective on bitou bush and is well tolerated by native species (so far more than 110 species of native plants have shown tolerance to glyphosate) (Toth *et al.* 1996). Staff are also working closely with scientists monitoring the impacts of bitou bush on invertebrates (the Australian Museum, G. Cassis personal communication), birds (the University of Wollongong, R. Whelan personal communication) and the development of rehabilitation programs (CSIRO Division of Plant Industries, R. Groves personal communication).

Service staff are also attempting to foster volunteer bush regeneration groups for most areas where bitou bush is a problem.

**Groundsel bush** Groundsel bush is an important weed in many coastal areas of New South Wales, especially the North Coast. It thrives in saline, semi-tidal conditions to readily colonize coastal swamps and forests which have been disturbed by fires, floods or human activities. Until recently groundsel bush infested large areas of the Yuraygir and Bundjalung National Parks and nearby nature reserves, where it competes with native plants, often replacing them completely. In a major program Thomas (1995) has treated over 1100 ha of groundsel bush, and many of the areas are now free of the weed.

**Scotch broom** Scotch broom (*Cytisus scoparius*) is very competitive with native species often excluding

understorey species. The seed has considerable dormancy and can survive in the soil for many years to germinate when favourable conditions occur.

Scotch broom is a serious threat to the integrity of plant communities in a number of conservation areas. The largest infestation occurs in the Barrington Tops area, although other major infestations occur in the Central and Southern Tablelands and in Kosciusko National Park.

The Service is currently developing management plans for each of its parks in which Scotch broom occurs. These will involve the use of herbicides and biological control agents, and in some instances, physical removal.

The Service contributes to the co-operative program for biological control of Scotch broom. The program is also supported by NSW Agriculture, CSIRO, State Forests of New South Wales and the Hunter Pastoral Company. Recently a major grant has been provided by the NSW Environmental Trusts.

Already three agents have been released: the broom twig mining moth (in 1993), the broom psyllid (in 1994) and the broom seed beetle (in 1995). As with most biological control programs the greatest impact is likely to be achieved if a number of agents feeding on different plant parts are available. Hence, further introductions of biocontrol agents for Scotch broom are planned for the near future.

**Serrated tussock** The NPWS is co-operating with NSW Agriculture, local government councils, Landcare groups, catchment management committees and agribusiness in a major campaign on serrated tussock. The aim of this campaign is to develop a strategic approach to the control of this weed. As part of this approach two co-operative aerial spraying programs have been undertaken in and around Deua National Park and Tinderry Nature Reserve.

The Service has also contributed towards an international survey for potential biological control agents for serrated tussock which has recently been undertaken in Argentina.

**Bushland regeneration programs** Bush regeneration is the rehabilitation of bush from a weed-infested, or otherwise degraded plant community to a healthy community composed of native plants (Buchanan 1989). Bush regeneration programs run by the Service often involve a wider range of activities than weed control *per se*: these include botanical surveys, site assessments, stormwater amelioration, weed mapping, seed collection and propagation, tree planting and neighbour relations and education (L. Rees personal communication).

The NPWS is working closely with volunteers to help rehabilitate bushland in many of our national parks.

Some of the most active programs are in the Sydney Metropolitan area. Volunteers regularly work with the Service helping to rehabilitate areas infested with weeds such as Madeira vine, morning glory, (*Ipomoea* spp.), asparagus ferns, (*Protasparagus* spp.), lantana, privet, balloon vine (*Cardiospermum grandiflorum*), bitou bush, Turkey rhubarb (*Acetosa sagittata*) and wandering Jew (*Tradescantia albiflora*).

The North Metropolitan District has a very active bush regeneration team which supervises more than 35 groups with a total of more than 300 volunteers in the Lane Cove, Garigal and Kuringai Chase National Parks (Rees 1996). Such volunteer programs contribute enormously to the Service's weed control effort and Rees (1996) presents an excellent analysis of the value of volunteer programs supervised by NPWS and local government agencies in the Sydney region. The value of the labour to the Service for a recent 12 month period has been estimated to be worth more than \$A240 000. A quarterly newsletter (*Regenavitis*) has been produced, as well as several weed technical sheets, and regular training workshops are held for the volunteers.

The Sydney and South Metropolitan Districts also have very effective volunteer programs operating in the Sydney Harbour, Botany Bay and Royal National Parks. Successful volunteer programs also exist in many other parks.

**Rainforest weeds** Seventy five per cent of the rainforest present in Australia at the time of European settlement has now been cleared. Much of what remains is fragmented and subjected to disturbance by fire, desiccation and increased light penetration (Humphries *et al.* 1991).

The Service is undertaking rehabilitation works in Big Scrub and littoral rainforest remnants in a number of reserves in northern New South Wales. The philosophy adopted in these programs is that effective rehabilitation of native plant communities requires an integrated approach based on a thorough understanding of the rainforest ecosystem. While weed control is a vital component of such a program, the aim is to replace all weeds with native species in such a way that the process of natural regeneration and succession is sustainable. This contrasts with the more traditional approach of selectively removing individual species.

In the Boatharbour Nature Reserve 23 weed species were identified with the most common species being Madeira vine and wandering Jew. The presence of Madeira vine poses the most serious threat to this reserve and it will require a long-term weed control program to reduce the area infested and then to maintain it at manageable levels. The eastern portion of this Reserve is particularly degraded and is the major source of spread

because of its upstream position. Wandering Jew poses a further threat because of its density which restricts the germination and establishment of native species. Most of the remaining weed species are more limited in their distribution and abundance. However, they have the potential to increase unless appropriate management strategies are adopted (Joseph 1995).

In the Brunswick Heads Nature Reserve 56 weed species were identified and their importance varied with habitat. Important species include bitou bush, lantana, Cape ivy (*Delairea odorata*), coral berry (*Rivina humilis*), climbing asparagus (*Protasparagus plumosus*), ground asparagus (*Protasparagus aethiopicus*), Madeira vine, glory lily, coastal morning glory (*Ipomoea cairica*), camphor laurel (*Cinnamomum camphora*), common morning glory (*Ipomoea indica*) and fishbone fern (*Nephrolepis cordifolia*).

Other important rehabilitation programs are being undertaken in lowland sub-tropical rainforest remnants on Susan Island in the Clarence River and on Cocumbac Island in the Manning River.

**Mapping weed distributions** District staff are recording the distribution of all major weeds. The eventual aim is to develop a statewide database to record and map the distribution of important weed species throughout the reserve system. Apart from the rainforest remnants project discussed previously, other mapping programs underway include groundsel bush in the Yuraygir and Bundjalung National Parks and Scotch broom in the Kosciusko National Park. Re-mapping of the distribution of bitou bush is also planned for the near future.

Staff from the Blue Mountains District have played a major role in developing a database to record the distribution of weeds and to identify factors favouring their establishment in the upper catchment of the Hawkesbury-Nepean River. A number of other flora surveys have been undertaken.

#### CONCLUSION

In New South Wales the emphasis on declaration under the Noxious Weeds Act, and hence enforced action for the community's good, is on agricultural weeds. The NSW Noxious Weeds Strategy, currently under development, needs to adequately address environmental weeds. This must include adequate funding for research and strategic planning, as well as for the implementation, and where necessary, enforcement of control programs. The inclusion of a Natural Ecosystems Program in the Weeds CRC is an important development, but the balance of funding for weed control is still heavily weighted towards agricultural weeds. Statements such as 'current action for control of bitou bush/boneseed is adequate but must be

maintained' (from the Draft National Weeds Strategy) indicates either a bias, or gross lack of appreciation of the magnitude of the problem.

Although NSW National Parks and Wildlife Service has substantially increased funding for weed control on lands under its control, further increases are needed to adequately address the problem. Similar increases to funding for weed control need to be made available for other public land managers in Australia, and for research on environmental weeds.

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#### REFERENCES

- Buchanan, R.A. (1989). Bush Regeneration: Recovering Australian Landscapes. (NSW TAFE, Sydney).
- Humphries, S.E., Groves, R.H. and Mitchell, D.S. (1991). Kowari 2 - Plant Invasions: The Incidence of Environmental Weeds In Australia. (Australian National Parks and Wildlife Service, Canberra).
- Joseph, R. (1995). Rainforest Remnants: Restoration and Rehabilitation Project. Final Report for the NSW National Parks and Wildlife Service, 50 pp.
- Rees, L.M. and Smith, M.G. (1996). Volunteers: Can they make a difference? Proceedings of the Eleventh Australian Weeds Conference, Melbourne, pp. 366-9.
- Thomas, J. (1995). Groundsel bush management plan. Proceedings of the Eighth Biennial Noxious Weeds Conference, pp. 82-4.
- Toth, J., Milham, P.J., Meszaros, I., Kaldor, J., Fullerton, R.N. and Burrows, F. (1996). Research on chemical control of bitou bush in New South Wales. Proceedings of the Eleventh Australian Weeds Conference, Melbourne, pp. 468-75.