23. WEEDS IN NATIONAL PARKS OF WESTERN AUSTRALIA

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NATIONAL PARKS AUTHORITY OF WESTERN AUSTRALIA

The Weeds

In the National Parks of Western Australia, and in fact within the State, weed species may be divided into two classes: those declared under the Agriculture and Related Resources Protection Act 1976-1980, and species which are not declared under this Act but constitute a hazard to bushland in that they out-compete or otherwise displace native vegetation. Examples of the former are Blackberry (Rubus fruticosus) or Cape Tulip (Homeria spp), and of the latter Blue Lupins (Lupinus angustifolius) and Cat Grass (Avena spp).

The Authority is required, under the Agriculture and Related Resources Protection Act, to take active measures to control and preferably eradicate declared species. Similarly all landholders in Western Australia have the same responsibility. With the non-declared species the Authority simply chooses to take action to control them in order to protect the environment.

Declared plants of concern in Western Australian National Parks are listed in Table 1 and non-declared species against which action is taken are listed in Table 2.

Table 1

Primary Concern	
Apple of Sodom	Solanum sodomeum
Arum Lily	Zantedeschia aethiopica
Africa Thistle	Berkheya rigida
Blackberry	Rubus fruticosus
Cape Tulip	Homeria breyniana
	H. mineata
Doublegee	Emex australis
Paterson's Curse	Echium plantagineum
Saffron Thistle	Carthamus lanatus

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Table 1.....(contd)

Secondary Concern	
Calotropis	Calotropis procera
Caltrop	Tribulus terrestris
Dock	Rumex spp
Geraldton Carnation	Euphorbia terracina
Mesquite	Prosopis spp.
Parkinsonia	Parkinsonia aculeata

Table 1. Plants declared under the Agriculture and Related Resources Protection Act 1976-1980 and considered of primary and secondary concern with regard to eradication from National Parks in Western Australia.

Table 2

Common Name	Taxonomic Name	Importance	Commonest Habitat
Barley Grass	Hordeum leporinum	Mod	Sand dune rehabilitation
Black Nightshade	Solanum nigrum	Low	Edges of carparks
Boxthorn	Lycium ferocissimum	Mod	Old habitations
Buffel Grass	Cenchrus ciliaris	Mod	Waterways in North of State
Cape Weed	Arctotheca calendula	Mod	Roadsides, railways
Castor Oil Bush	Ricinus communis	High	Garden Island National Park
Cats Ear	Hypochaeris spp	Low	Picnic areas
Clover	Trifolium spp	Mod	Picnic areas
Cotton Bush	Asclepias fruticosa	High	Waterways, lakes
Couch Grass	Cynodon dactylon	High	Waterways in North of State
Date Palm	Phoenix dactylifera	High	Millstream National Park
Datura	Datura spp.	Low	Waterways in North of State
Fennel	Foeniculum vulgare	Mod	Roadsides, Yanchep N/Park
Fireweed	Senecio linearifolius	Low	Roadsides
Guildford Grass	Romulea longifolia	Mod	Picnic areas
Hares Tails	Lagurus ovatus	Low	Sand dunes
Khaki Weed	Alternanthera pungens	High	Picnic areas in North of WA
Kikuyu	Pennisetum clandestinum	Mod	Waterways
King Is. Melilot	Melilotus indicus	Mod	Coastal
Lupin (Blue)	Lupinus angustifolius	High	Disturbed and post-fire
Mallow	Malva sp.	Mod	Coastal and islands
Narrow-leaf Clover	Trifolium angustifolium	Mod	Coastal
Native Passionfruit	Passiflora foetida	High	Wetter areas in North of WA
Oat Grass	Avena spp	High	Roadsides, boundaries
Onion Weed	Asphodelus fistulosus	High	Light coastal soils
Star Thistle	Centaurea calcitrapa	High	Light coastal soils
Sticky Bartsia	Parentucellia viscosa	Low	Coastal
Stinkwort	Inula graveolens	Mod	Roadsides, parking areas
Storksbill	Erodium spp	Mod	Picnic areas
Tree Tobacco	Nicotiana glauca	Low	Light coastal soils
Veldt Grass	Ehrharta longiflora	Mod	High rainfall south-west
Watsonia	Watsonia bulbillifera	High	Waterways
Wild Radish	Raphanus raphanistrum	Low	Disturbed areas

Table 2. Plants not at present declared under the Agriculture and Related Resources Protection Act 1976-1980 but considered by the National Parks Authority of Western Australia to be a threat to the natural environment. Their relative level of importance within Parks is listed together with the habitat in which they most commonly occur. If the problem species is restricted to only one National Park this is indicated in the habitat column.

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Distribution of Weeds

On a State level it is apparent that there is a direct relationship between abundance of weeds and proximity of the Parks to population centres. Table 3 lists the Parks which contain 10 or more weed species and against which eradication action is taken on a regular basis.

National Park	Number of weed species	Location
Gooseberry Hill	20	Metropolitan
John Forrest	18	Metropolitan
Avon Valley	17	Agricultural area
Walyunga	14	Metropolitan
Leeuwin-Naturaliste	14	South-coastal
Serpentine	13	Metropolitan
Lesmurdie	13	Metropolitan
Yanchep	12	Metropolitan
Neerabup	11	Metropolitan
Greenmount	10	Metropolitan

Table 3: National Parks which contain 10 or more weed species against which management action is taken, and the regional location of each Park.

It is seen from Table 3 that of the 10 Parks 8 are in the Metropolitan Area. Visitor levels may be as high as 0.5 million persons per year. Avon Valley National Park in contrast, is relatively low in visitor numbers, but is surrounded by agricultural land and contains a river fed from 98,000 square kilometres of catchment, mostly under wheat and sheep farming. The other non-metropolitan Park is the Leeuwin-Naturaliste National Park. This is a linear, coastal reserve which contains the lower reaches of 16 major creek systems and many minor watercourses which in turn drain about 1,000 square kilometres of catchment under dairy, sheep, grain crops and vineyards.

It is clear that primary causes of infestation in such circumstances arise from high levels of visitation with consequent disturbance of the bushland (direct or indirect), or from proximity to agricultural areas. This relationship is supported by observations in Parks with lesser numbers of weed species.

At the local level associations between the environment and weed species are often quite specific. Typical examples would be Apple of Sodom (Solanum sodomeum) which is rarely found outside areas with heavy rabbit infestations (past or present), old stockyards or a long history of sheep grazing; Barley Grass (Hordeum leporinum) which is frequently associated with the use of hay/bitumen emulsions for dune stabilisation; or Date Palms (Pheonix dactylifera) which cause a problem only at one location

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(Millstream National Park) in Western Australia where they were introduced as a food source in the 1800's and where they now displace native palm species. Weed species such as these usually form pockets of high density and to some extent this simplifies control.

Other species e.g. Arum Lily (Zantedeschia aethiopica), Cats Ear (Hypochaeris spp), Guildford Grass (Romulea longifolia) and Watsonia (Watsonia bulbillifera) spread rapidly through relatively undisturbed bushland. Eradication is difficult or impossible because of the dispersed nature of the infestation and the close intermingling of the weed species with native plants.

Some weeds are very adaptable to variations in rainfall or local soil conditions and consequently are widespread even in a State as big as Western Australia. Examples of species widespread in National Parks are presented in Table 4.

Table 4

Weed Species	Number of Parks	Importance
Stinkwort (Inula graveolens)	20	Low
Cape Tulip (Homeria spp)	16	High
Wild Radish (Raphanus raphanistrum)	14	Low
Dock (Rumex spp)	13	Low
Clover (Trifolium spp)	12	Low
Blue Lupin (Lupinus angustifolius)	11	Low
Couch Grass (Cynodon dactylon)	11	Low
Guildford Grass (Romulea longifolia)	10	Low
Caltrop (Tribulus terrestris)	10	High

Table 4: Weed species which occur in 10 or more National Parks in Western Australia, the number of Parks in which they occur, and their relative importance in reference to overall detrimental effect on the enviornment.

It is seen from Table 4 that of the nine most widespread weeds seven are considered of low importance because their overall effect on the environment is not great except in badly disturbed areas. Only two are of significant importance: Cape Tulip which rapidly replaces native vegetation, is dispersed and difficult to eradicate; and Caltrop which grows rapidly and abundantly in areas of high visitation (e.g. barbecue sites) in the hotter north-west of the State.

Thus, to summarise, Western Australia is fortunate in that the majority of declared plants which must be controlled are not widespread in National Parks. Additionally the "pest" species which are not declared, although difficult to control, are mostly abundant in Parks with high levels of visitation.

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Emphasis in these parks is on recreation rather than conservation; consequently the abundance of weeds is a problem only in terms of fire control, aesthetics or inconvenience to visitors rather than a direct threat to the environment.

Action taken to control weeds

Action taken depends strongly on the location, the degree of infestation and other factors. Minor weeds in public areas e.g. Lupins in picnic grounds are removed by hand or mown. The main thrust of weed control by the National Parks Authority is in dealing with plants declared under the Agriculture and Related Resources Protection Act; and a few specific pest species, Boxthorn, Castor Oil Bush, Date Palm, Khaki Weed and Watsonia in particular.

The Authority does not employ its own spray team but relies almost entirely on the expertise and manpower of the Agricultural Protection Board (APB) of the W.A. Department of Agriculture. Some of the methods and season of treatment which have been used by the APB in W.A. National Parks are listed in Table 5.

Table 5

Weed Species	Method of Control	Chemicals used	Season
Apple of Sodom	Spray-burn-spray	Amitrol, Hyvar X	Spring
Arum Lily	Spray only	2,4-D Amine	Spring-summer
Africa Thistle	Spray only	Amitrol T, Farmco D500	Autumn, spring
Blackberry	Spray-burn-spray	2,4,5-T Amine, Garlon Roundup	Summer
Cape Tulip	Spray only	2,4-D Amine	Spring
Doublegee	Spray only	2,4-D Amine, Hyvar, Dicamba	Winter,spring
Patersons Curse	Spray only	2,4-D Amine	Winter
Saffron Thistle	Spray only	2,4-D Amine	Winter
Box Thorn	Cut-burn-spray	Roundup	Autumn
Castor Oil Bush	Bulldoze or cut-burn-spray	Roundup	Autumn
Date Palm	Cut, or burn then cut, poison	diesel, 2,4-D Amine Roundup, Vorox AA	All times
Khaki Weed	Spray only	2,4-D Amine	Dry season
Watsonia	Spray only	2,4-D Amine	Spring

Table 5: Weed species, the methods of control used in the past, the spray* chemicals used and their season of application.

* For spray also read wick applicator in some situations e.g. Arum Lily, Cape Tulip, Watsonia.

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It can been seen from Table 5 that 2,4-D Amine has featured strongly in past control measures. Recent policy against the use of this herbicide and 2, 4, 5-T Amine by the Australian Council of Trade Unions have led to its discontinuation and replacement by other chemicals. Roundup (glyphosate) is emerging as a forerunner in more recent control measures and despite its higher cost is proving very satisfactory in its effectiveness. In the long term therefore it may prove less expensive.

Use of summer oil or wetting agents as additives to herbicides has also proven effective and helps to reduce the overall amount of chemical used.

Mechanism of Control

In past years the National Parks Authority of W.A. has taken the approach that almost all weed control using herbicides was carried out under recommendations of, and physically by, the Agricultural Protection Board of the Department of Agriculture. Ranger use of herbicides was limited in order to protect the men from unnecessary contact with the chemicals.

With increasing costs of using APB or private contractors for weed control there is now a greater need for ranger staff to undertake this work. On 15th September 1983 the Western Australian State Government directed that all employees using chemical pesticides must be specially trained and that courses of instruction by the Pest Control Branch of the Public Health Department were to be provided accordingly. The approach of the National Parks Authority to this directive will probably be to send selected rangers to these training programmes and on completion of the course undertake at least some weed control. It is anticipated that together with adoption of this new training will be special input by the National Parks Authority into environmental aspects of weed control in National Parks. The two approaches, when taken together, are expected to produce specialised ranger staff to undertake some future weed management.

Research

The National Parks Authority of W.A. has no research staff of its own and consequently only maintains a role of co-operation with other research organisations. One of the most interesting studies undertaken in this capacity has been a joint APB/National Parks project on the efficiency of weed control amongst native vegetation using available herbicides.

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The work, undertaken in 1979 and 1980 dealt with an area of bushland in Gooseberry Hill National Park, about 15 km east of Perth. The site was on granitic loamy soils of the Darling Scarp where rainfall was about 920 mm/year. Vegetation was heathy, dominated by Hibbertia, Acacia and Phyllanthus species and heavily infested with Wild Oats (Avena spp) Silver Grass (Vulpia sp), Brome Grass (Bromus spp), Cats Ear (Hypochaeris radicata), Blue Lupins (Lupinus angustifolius) and Couch Grass (Cynodon dactylon).

Various available herbicides were then applied and effectiveness of weed control with only minor loss of native plant species measured. It was found that Roundup applied at 3 litre/ha* and Vorox AA applied at 6 litre/ha* were the most effective, producing about a 50% kill of weed species accompanied by very little loss of native plants. Because of manpower restrictions the programme was discontinued, but the experiment did emphasise that "selective" control may be possible in some circumstances using available chemicals. Further it demonstrated that much more research is needed in this field of study.

The Future

It is my opinion that improvement of methods of future weed control lies not only in the development of new and more effective chemicals. I feel that insufficient attention has been given to adequate scientific monitoring of the effectiveness of existing herbicides under various conditions of season, rainfall, soils, weed species etc. This is examplified in the numerous texts on the subject which often recommend very different approaches or chemicals for control of the same weed.

It seems that a chemical is often seen as "working" or "not working" with little further consideration of details of application method, timing and other factors.

Secondly, insufficient attention seems to have been given to the control of non-declared pest species such as Lupins or Couch Grass which, although of little agricultural significance, have considerable effect on the conservation value of many nature reserves and national parks.

Finally, probably in conjunction with my first point regarding efficiency of existing herbicides, there seems to be great opportunity for detailed study of "selective" characteristics of commonly used, broad-spectrum herbicides as control measures in mixed target/non-target plant communities.

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* At standard dilution recommended by manufacturer.