

# **Southern Tablelands & South Coast Noxious Plants Committee**

## **Natural Disaster Weed Strategy**



*prepared by*

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## **Acronyms**

<b>ACT</b>	Australian Capital Territory
<b>ACTDUS</b>	ACT Department of Urban Services
<b>ACTWWG</b>	ACT Weeds Working Group
<b>CMB</b>	Catchment Management Boards
<b>CMBp</b>	Catchment Management Blueprint
<b>CRC</b>	Cooperative Research Centre
<b>DLRA</b>	Department of Lands and Rural Affairs (formerly Department of Lands and Water Conservation)
<b>EP&amp;BC Act</b>	Environment Protection and Biodiversity Conservation Act 1999
<b>LCA</b>	Local Control Authority
<b>LGA</b>	Local Government Area
<b>NDRA</b>	Natural Disaster Relief Arrangements
<b>NHT</b>	Natural Heritage Trust
<b>NRM</b>	Natural Resources and Mining (Qld)
<b>NSW</b>	New South Wales
<b>NSW Ag</b>	NSW Agriculture
<b>NSWNPWS</b>	NSW National Parks and Wildlife Service
<b>NW Act</b>	Noxious Weeds Act 1993
<b>NWAC</b>	Noxious Weeds Advisory Committee
<b>RLPB</b>	Rural Lands Protection Board
<b>RWEO</b>	Regional Weed Extension Officer
<b>ST&amp;SCNPC</b>	Southern Tablelands and South Coast Noxious Plants Committee

## **1. Introduction**

Natural disasters including flood, fire, and drought, impact immediately on the community through the loss of life, destruction or damage to property and natural resources, and the resultant economic, social and environmental costs. The establishment and spread of weeds as a direct result of natural disaster has a more insidious impact, as it can inflict a high cost to the community in both environmental damage and lost production many years after the disaster event.

The Southern Tablelands and South Coast Region's ability to prepare, manage and in some cases capitalise on natural disasters will influence the level of long-term impact weeds will have on the community, natural resources and the environment after a disaster event.

The Southern Tablelands and South Coast Natural Disasters Weed Strategy (hereafter referred to as **The Strategy**) has been produced to provide regional frameworks and guidance for the development of more specific priorities and actions at a local or catchment level in the event of a natural disaster. A management strategy that takes an integrated and coordinated approach to managing weeds will facilitate effective management of weeds after a disaster.

### **1.1 Aims and Objectives**

The Strategy seeks improvement in natural disaster planning and a sustainable reduction of significant weeds within the Region. The two primary aims for disaster planning for weeds are to:

1. prevent new weed infestations; and
2. reduce the impact of existing weed infestations.

#### **Objectives and broad strategies to achieve these aims are:**

- to utilise both regulation and education as a means of control;
- to provide education and extension programs for private landholders and government land management authorities to raise awareness and understanding of weed responses to fire, flood and drought;
- to develop and implement risk reduction strategies and actions to reduce weed invasion risk on a property, local and regional level;
- to identify and develop strategies to take advantage of opportunities presented by natural disasters;
- to make available to all land managers best management practices to reduce the impact and spread of weeds during and after disasters;
- to identify priority weeds and areas that should be targeted for control after disasters;
- to identify additional funding and operational resources.

## 2. Weed responses to natural disasters

There are three things required for weeds to invade and become established; 1) a source of propagules (seeds, bulbs, and pieces of stem or root); 2) suitable growing conditions and 3) disturbance. Disasters such as drought, fire and flood can create these conditions in a number of ways including:

- damaging existing ground cover reducing competition for light, nutrients, moisture, and space;
- stimulating weed seed germination;
- directly or indirectly introducing weed propagules into new areas; and
- providing ideal condition for weeds that are adapted or respond well to fire, flood or drought.

Floods, fires and drought can have both a negative and positive influence on the density of weeds. These influences or impacts are complex and knowledge of weed ecology and weed responses to disasters must be known and understood to either capitalise on opportunities or prepare strategies to combat the potential increase of weeds.

### 2.1 Drought

Weeds that are an invasion threat during and after drought are listed in Table 1. This is by no means an exhaustive list as there are many fallow weeds in cropping situations too numerous to list; common heliotrope (*Heliotropium europaeum*), Bathurst and noogoora burrs (*Xanthium spp.*), thistles, mintweed (*Salvia reflexa*) and Johnson grass (*Sorghum halepense*) are the more important of these (NSW Agriculture 2001). Whilst the impacts of these species are significant, they can be effectively or adequately controlled by a combination of cultivation and herbicide spraying (NSW Agriculture 2002). Non-arable lands and pastures pose the greatest challenges for weed management during and after droughts. Exacerbation of weed problems in these areas can cause additional and unplanned financial burden in both lost production and cost of control after a long period of low farm productivity.

There are a number of means by which drought increases the density and distribution of certain weeds in non-arable lands (see Table 1). Firstly, as competition is significantly reduced, weeds that are unpalatable and drought resistant are quick to establish when more favourable conditions arrive. The presence of livestock on a property during and in the recovery phase of a drought exacerbates this problem as they allow unpalatable weeds to establish to the detriment of desirable palatable species.

Secondly, grazing land is at risk of weed invasion through the unintentional use of contaminated fodder. Weed seed may be inadvertently spread around the property at the time of feeding, or in the animals' dung days after the contaminated fodder has been eaten. Table 1 lists many species that are

currently considered major weeds in the Region that are potentially spread by drought fodder feeding.

Finally, animals introduced onto a paddock, either in a restocking program or returning from agistment, can also introduce weeds (Table 1). These weeds are imported predominantly through seed attaching to the fur or in the gut of animals.

**Table 1: Weed species advantaged by the effects of drought**

means of incursion	Species name	Common Name
<b>unpalatable to livestock</b>	<i>Nassella trichotoma</i> <i>Eragrostis curvula</i> <i>Baccharis halimifolia</i> <i>Nassella neesiana</i> <i>Marrubium vulgare</i>	serrated tussock African lovegrass groundsel bush Chilean needlegrass horehound
<b>drought resistant</b>	<i>Nassella trichotoma</i> <i>Eragrostis curvula</i> <i>Robinia pseudoacacia</i> <i>Nassella neesiana</i> <i>Xanthium occidentale</i>	serrated tussock African lovegrass false acacia Chilean needlegrass noogoora burr
<b>accidentally introduced and spread in emergency fodder</b>	<i>Senecio madagascariensis</i> <i>Parthenium hysterophorus</i> <i>Hypericum perforatum</i> <i>Nassella neesiana</i> <i>Acetosa vulgaris</i> <i>Echium spp.</i>  <i>Onopordum spp.</i> <i>Carduus nutans</i> <i>Solanum elaeagnifolium</i> <i>Raphanus raphanistrum</i> <i>Emex australis</i> <i>Eragrostis curvula</i> <i>Sida rhombiflora</i>	fireweed parthenium weed St Johns weed Chilean needlegrass sheep sorrel Patterson's curse, vipers bugloss thistles nodding thistle silver-leaf nightshade wild radish spiny emex African lovegrass Paddy's lucerne
<b>introduced onto property through restocking or stock returning from agistment</b>	<i>Hypericum perforatum</i> <i>Nassella trichotoma</i> <i>Echium spp</i> <i>Eragrostis curvula</i> <i>Xanthium occidentale</i> <i>Nassella neesiana</i> <i>Sida rhombiflora</i>	St John wort serrated tussock Pateron's curse African lovegrass noogoora burr Chilean needlegrass Paddys lucerne
<b>tubers, crown or roots can tolerate drought and quickly reshoot when conditions ease</b>	<i>Rubus fruticosus</i> <i>Hypericum perforatum</i>	Blackberry St Johns wort

Other major weeds of concern for the Region that originate in other States are parthenium weed from Queensland, biflora (*Biflora testiculata*) and bedstraw/cleavers (*Galium triconium*) from South Australia - the latter two are widespread in the South Australian wheat belt (NSW Agriculture Agnote DPI-349).

Fodder feeding also increases the risk of introducing strains of common weeds that are resistant to herbicides. Herbicide resistance is widespread in

the grain belts of South Australia and Western Australia. Large quantities of grain are often obtained from these areas during drought conditions in NSW (NSW Agriculture Agnote DPI-349). Ryegrass is of particular concern on land that is sown to crops, because of the large number of herbicides to which ryegrass is resistant (Chemcert 1999).

Weed control operations can also be significantly affected by drought for the following reasons:

- Pre-emergent herbicides are highly dependent upon rainfall for activation or movement into the zone of weed seed germination. Sunlight degrades pre-emergent herbicides on the soil surface, and if rainfall or irrigation does not follow within seven to ten days after application, poor weed control often occurs (Brown and Worsham 1994).
- The effectiveness of post-emergent herbicides, particularly those that are translocated within the target plant is highly dependent upon active plant growth. Good moisture, moderate temperatures, and high relative humidity are conditions favourable for maximum growth and herbicide activity. These conditions do not occur during drought and plant growth is typically retarded, and consequently herbicides will not be as effective during these conditions.
- Drought may also influence herbicide persistence within the soil. Soil microorganisms play a significant role in the degradation of many herbicides. Activity of soil microbes is favoured by warm, moist conditions. Under dry conditions, microbial degradation slows and herbicide persistence in the soil is extended (Brown and Worsham 1994).
- Inspectorial and operational funding for Councils, National Parks, DLRA and other land management agencies are annual. Funds that are not spent due to drought are currently not rolled-over into the following year when, if the conditions are more favourable to plant growth, an explosion of weeds listed in Table 1, is expected. The anticipated population explosion in the years following drought usually far exceeds what can be managed with expected annual operational funding. Councils', and agency (e.g. NSW Agriculture, NSW NPWS) funding administration policies must be made more adaptable so that unspent funds can be rolled over and used as additional funding to combat the expected increases in weed infestations post drought.

## **2.2 Fire**

Wildfires can have numerous impacts on agricultural production including stock, machinery and property losses, and damage to fences, crops and pasture. Wildfire can also pave the way for weed infestation by creating bare ground, increase available nutrients, reduce competition, and by stimulating weed seed germination. Fire can cause secondary problems such as increased erosion, increased traffic access by humans and pest animals, and further invasion by weeds through earth-moving machinery and firefighting appliances and equipment.

Table 2 is a list of weed species that will benefit from wildfire. Wildfire can benefit these weed species by;

- providing a competitive advantage for species that have underground tubers, rootstock, crown or basal buds or other protective regenerative organs that have the ability to rapidly resprout after fire;
- promoting the germination of seeds;
- being accidentally introduced and spread in emergency fodder;
- through stock returning from agistment or in restocking programs;
- through seed attached to earth-moving equipment and fire fighting appliances; and
- opening up pathways (through the construction of dozer lines) for animals which have the potential to spread weed seeds.

The level to which weed species are benefited by fire is, however, dependent on the season and the intensity of the fire. For example, a low to moderately intense wildfire in autumn or winter generally favours St. Johns wort as the crowns can reshoot and establish dramatically over the cooler months after being burnt. A high intensity fire in spring however, would be expected to destroy the majority of crowns and favour other species that can germinate and compete successfully with St Johns wort under warmer conditions (Briese *et al* 2000). Knowledge of fire and weed ecology is, therefore, of utmost importance. Section 3 p.10 details current knowledge of the fire ecology of many regionally significant weeds.

**Table 2: Weed species advantaged by fire**

means of incursion	Species name	Common Name
plant has underground tubers, rootstock, crowns, basal buds or otherwise has the ability to rapidly regenerate or resprout after fire	<i>Hypericum perforatum</i> <i>Olea europaea</i> <i>Chrysanthemoides monilifera</i> <i>Rubus fruticosus</i> <i>Lantana camara</i> <i>Leycesteria formosa</i> <i>Eragrostis curvula</i> <i>Nassella trichotoma</i>	St Johns wort olive bitou bush blackberry lantana Himalayan honeysuckle African lovegrass serrated tussock
fire promotes germination of seed	<i>Cytisus scorparius</i> <i>Ulex europaeus</i> <i>Chrysanthemoides monilifera</i> <i>Onopordum spp.</i> , <i>Cirsium spp.</i> , <i>Carduus spp.</i> <i>Arctotheca calendula</i> <i>Echium plantagineum</i> <i>Erodium spp</i> <i>Eragrostis curvula</i> <i>Nassella trichotoma</i> <i>Genista spp.</i>	broom gorse bitou bush/boneseed thistles  cape weed Paterson's curse crowsfoot African lovegrass serrated tussock Montpellier broom

means of incursion	Species name	Common Name
accidentally introduced and spread in emergency fodder* <sup>1</sup>	<i>Senecio madagascariensis</i> <i>Parthenium hysterophorus</i> <i>Hypericum perforatum</i> <i>Nassella neesiana</i> <i>Acetosa vulgaris</i> <i>Echium spp.</i>  <i>Onopordum spp.</i> <i>Carduus nutans</i> <i>Solanum elaeagnifolium</i> <i>Raphanus raphanistrum</i> <i>Emex australis</i> <i>Eragrostis curvula</i> <i>Sida rhombifolia</i>	fireweed parthenium weed St Johns weed Chilean needlegrass sheep sorrel Patterson's curse, vipers bugloss thistles nodding thistle silver-leaf nightshade wild radish spiny emex African lovegrass Paddy's Lucerne
introduced onto property through restocking or stock returning from agistment* <sup>1</sup>	<i>Hypericum perforatum</i> <i>Nassella trichotoma</i> <i>Echium spp</i> <i>Eragrostis curvula</i> <i>Xanthium occidentale</i> <i>Nassella neesiana</i> <i>Sida rhombifolia</i>	St John wort serrated tussock Paterson's curse African lovegrass Noogoora burr Chilean needlegrass Paddy's Lucerne
opening up pathways (if earth-moving machinery is used) for seeds to be spread by animals	<i>Rubus fruticosus</i> <i>Olea europaea</i> <i>Chrysanthemoides monilifera</i> <i>Crataegus monogyna</i> <i>Rosa rubiginosa</i> <i>Asparagus asparagoides</i>	blackberry olive boneseed/bitou bush hawthorn sweet briar bridal creeper
seeds accidentally introduced with earth-moving machinery and firefighting appliances and machinery	<i>Anthoxanthum odoratum</i> <i>Eragrostis curvula</i> <i>Achillea millefolium</i> <i>Hypericum perforatum</i> <i>Echium spp.</i>  <i>Carduus nutans</i> <i>Cytisus scorparius</i> <i>Eragrostis curvula</i> <i>Nassella trichotoma</i>	sweet vernal grass African lovegrass yarrow St Johns wort Paterson's curse, Vipers bugloss nodding thistle broom African lovegrass serrated tussock

\*1 The extent to which this will occur will vary depending on the time of year, the extent of damage to pastures, the follow-up climatic conditions and grazing pressures.

### 2.3 Flood

As rivers and streams are ideal wildlife corridors they are also one of the best vectors for the spread of weeds. Weed seeds that are adapted for dispersal by animals (both wildlife and stock) attaching to fur or in the gut, as well as by water are spread into, and up and down river systems. This is a natural process that occurs irrespective of natural disasters and usually impossible to control. For this reason, river systems will always be problematic and weed densities and diversity will always be significant.

Floods exacerbate weed problems by spreading seed (and other propagules) of weed species adapted to dispersal by water, downstream and into the flood zone and floodplains of the river system. Brown and Peet (2003) have shown that areas subject to frequent flooding show a higher number (up to 40 times more) of invasive exotic plants than upland regions outside the floodplains.

Floods also damage the existing vegetation, which reduces competition and assists in the establishment of weeds.

Table 3 lists weeds that can be advantaged by flood through the spread of propagules downstream and/or introduced as emergency fodder and/or through stock returning from agistment.

**Table 3: Weeds species advantaged by the effects of flood**

Means of incursion	Species Name	Common Name
<b>weeds have seeds or other propagules that are readily spread by flood water</b>	<i>Xanthium occidentale</i> <i>Delairea odorata</i> <i>Alternanthera philoxeroides</i> <i>Ligustrum sinense</i> <i>Eichhornia crassipes</i> <i>Salvinia molesta</i> <i>Salix</i> spp. <i>Cytisus scoparius</i> <i>Tradescantia fluminensis</i> <i>Ailanthus altissima</i> <i>Androdera cordifolia</i> <i>Ligustrum lucidum</i> <i>Ulex europaeus</i> <i>Sporobolus fertilis</i> <i>Asparagus asparagoides</i> <i>Eragrostis curvula</i> <i>Opuntia</i> spp. <i>Nassella trichotoma</i> <i>Hypericum perforatum</i> <i>Datura stramonium</i> <i>Nassella neesiana</i> <i>Galium triconium</i>	Noogoora burr cape Ivy alligator weed small-leaf privet water hyacinth salvinia willow and willow broom wandering Jew tree of heaven Madiera vine broad-leaf privet gorse giant Parramatta grass bridal creeper African lovegrass prickly pear serrated tussock St Johns wort common thornapple Chilean needlegrass bedstraw/cleavers
<b>accidentally introduced and spread in emergency fodder*<sup>1</sup></b>	<i>Senecio madagascariensis</i> <i>Parthenium hysterophorus</i> <i>Hypericum perforatum</i> <i>Nassella neesiana</i> <i>Acetosa vulgaris</i> <i>Echium</i> spp.  <i>Onopordum</i> spp. <i>Carduus nutans</i> <i>Solanum elaeagnifolium</i> <i>Raphanus raphanistrum</i> <i>Emex australis</i> <i>Eragrostis curvula</i>	fireweed parthenium weed St Johns weed Chilean needlegrass sheep sorrel Patterson's curse, vipers bugloss thistles nodding thistle silver-leaf nightshade wild radish spiny emex African lovegrass
<b>introduced onto property through restocking or stock returning from agistment*<sup>1</sup></b>	<i>Hypericum perforatum</i> <i>Nassella trichotoma</i> <i>Echium</i> spp. <i>Eragrostis curvula</i> <i>Xanthium occidentale</i> <i>Nassella neesiana</i>	St John wort serrated tussock Patterson's curse African lovegrass Noogoora burr Chilean needlegrass

\*1 The extent to which this will occur will vary depending on the time of year, the extent of damage to pastures, the follow-up climatic conditions and grazing pressures.

### 3. Opportunities for species management after disasters

Weeds that are readily burnt and have limited recovery ability [*i.e.* most pines, lantana (in high intensity fires), and cotoneaster (*Cotoneaster glaucophyllus*)] and plants that die or have a reduced fecundity after prolonged drought such as sweet vernal grass (*Anthoxanthum odoratum*) and fireweed (*Senecio madagascariensis*) are obvious examples of where natural disasters can have a positive impact on the management of weeds. Natural disasters may provide many other opportunities for weed control that were not previously present. However, to take full advantage of these, land managers have to be adequately prepared, planned and resourced, and able to recognise these situations when they arise.

#### 3.1 Flood

Though some weeds, such as, olive (*Olea europaea ssp. europaea*), boneseed/bitou bush (*Chrysanthemoides monilifera*), broom (*Cytisus scoparius*) and sweet briar (*Rosa rubiginosa*) are intolerant of waterlogging (Blood 2001), floods in Australia do not usually result in waterlogging sufficient enough to destroy existing weed populations. Weed control benefits from flooding are therefore limited.

#### 3.2 Fire

Prescribed fire has long been advocated as a management tool to control certain weed species in Australia. Wildfire, if taken advantage of, can also play a part in the management of weeds. Simply knowing the role fire plays in the ecology of weed species is paramount to the management of weed species, even if only to help make decisions about post wildfire management of weed infested areas (Downey 1999).

Weeds that have underground storage organs that resprout after fire, and/or seeds whose germination is stimulated by fire (Table 2) are often especially sensitive to herbicides within the first 1 to 3 months from the fire event (Tu *et al.*, 2001). The stimulation of seeds also reduces the seed bank making the entire population very susceptible to follow-up treatment such as herbicide application<sup>1</sup>, grazing or further follow-up spot-burning prior to seeding.

Fire can provide improved access, destroy the above ground biomass and the surface seedbank, and stimulate the germination of the remaining seedbank. This presents opportunities to deplete the soil seed bank by controlling germinating seed. The opportunity for local eradication may therefore exist. Conversely, if the same situation was to occur and these opportunities were not taken advantage of, the new seedlings will flourish in an environment

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<sup>1</sup> There needs to be a cautious approach to using herbicides after fire as the pH levels (Willis 2000) and the reduction of soil microbes (Brown and Worsham 1994) may increase the persistence of certain herbicides within the soil. Non target species that may be emerging may also be impacted.

lacking competition for nutrients and water. Table 4 is a preliminary list of regionally important weeds that are susceptible to control after wildfire, but will also require essential followup control.

### **3.3 Drought**

Although drought reduces weed fecundity, this effect is often negated, as weeds, by their very nature, tend to be adapted to a wide range of climatic conditions and generally produce more seeds than desirable species, even during droughts. The seeds of weed species also tend to more readily germinate and colonise bare ground after drought. Weed control benefits from droughts are therefore limited.

**Table 4: Weeds that are susceptible to followup control after wildfire**

Species Name	Common Name	Comment
<i>chrysanthemoides monolifera rotunda</i>	bitou bush	<p>Although a small proportion of plants resprout an intense fire kills most mature bitou bush plants. Fire also kills bitou bush seeds in the litter and topsoil and stimulates germination of seeds from lower in the soil profile. Fire, therefore, can be useful in reducing the large numbers of bitou bush seeds present in the soil (Vranjic 2000).</p> <p>The timing of herbicide application after the fire depends on many other factors but in general it is best to spray before seedlings start producing seeds but after they have grown sufficiently tall and self-thinned. The time for bitou bush seedlings to reach maturity is at least a year on the south coast (Vranjic 2000).</p>
<i>Ulex europaeus</i>	gorse	<p>Is only effective if the fire is extremely hot. Heat from the fire will cause germination of most of the soil seed.</p> <p>Seedlings can be treated either by cultivation, herbicide application or heavy grazing. Heavy grazing by sheep or goats can be an effective control on seedlings and regrowth following a wildfire (NRE 1998)</p>
<i>Rubus fruticosus</i>	blackberry	<p>Fire can destroy the above ground biomass and establish access for follow-up herbicide application or to clear areas of dead canes and to re-establish access for the rehabilitation of previously treated areas.</p>
<i>Lantana camara</i>	lantana	<p>Fire is generally insufficient by itself for lantana control, and additional treatments, such as herbicide application, are usually required.</p> <p>Pasture establishment can be achieved by seeding into burnt areas. This provides effective competition against lantana regrowth (NRM 2001).</p>
<i>Asparagus asparagoides</i>	bridal creeper	<p>Fires in late summer and early autumn can remove all understorey vegetation, thereby improving access to bridal creeper infestations for spraying (Willis 2000).</p> <p>In winter rainfall areas, bridal creeper often emerges before the first rains of the season, so that herbicides may be applied prior to the regeneration of indigenous vegetation (Willis 2000).</p>
<i>Cytisus spp and Genista spp.</i>	broom	<p>Wildfire effectively kills plants and encourages germination of seed. The resulting seedlings can then be treated with herbicides, heavy grazing or additional prescribed or spot burning.</p>

#### 4. General post-disaster weed management strategies

General weed and land management strategies following drought, fire and flood are detailed in various Agnotes and information items written by NSW Agriculture. These are readily available through the Internet at [www.agric.nsw.gov.au](http://www.agric.nsw.gov.au) and include;

- DA1-206 (2000): *Impact of Drought* by McKiernan, B.
- DPI-351 (2001): *Weed Strategies following drought, fire and flood* by Trounce, B. and Dellow, J.
- P2.3.7 (1997): *Pasture recovery after bushfires* by McGowen, F.
- AO.1.3 (2002): *Risk management for stockowners in times of fire and flood* by Bowler, J.
- DAH-6 (2002): *Drought Strategies for the livestock producers* by Makwick, G.
- M1.6 (2000): *Agistment guidelines* by Davies, L. and Sell, I
- DAI155 (2000): *Drought Hints for a beef cattle enterprise* by Clayton, E., Blackwood, I., and McKiernan, B.
- DPI-349 (2001): *Weeds – a threat to drought recovery* by The Weeds Subprogram
- DPI-355 (2002) *Soil Management following drought* by Abigail Jenkins
- NSW Agriculture (2002) *Information on importing hay into NSW from interstate*
- Michelmore, M. (2003) Reducing weed dispersal. NSW Agriculture (see extracts in Appendix 2)

Although the information within these Agnotes is comprehensive and provides good advice to graziers and land managers, it is uncertain whether this information is readily accessible, other than through the Internet. An extension program to disseminate this information to landholders during drought and after fire and flood events is seen as a priority (see Section 6 p.22). A radio campaign advertising what is available through NSW Agriculture and their websites, could also be a less expensive but effective alternative.

These Agnotes are predominantly directed at livestock owners and detail measures to reduce the potential for weed problems after a disaster through weed control, pasture management and recovery, grazing management, and appropriate fodder feeding. These strategies are summarised in the following subsections.

##### 4.1 Drought and stock famine effects from flood and fire

Loss of effective ground cover due to drought, fire and overgrazing may leave land highly prone to weed invasion. The principle aim after the first rains is to establish pasture or crop cover on bare paddocks as soon as possible.

New weed infestations and the exacerbation of existing weed infestations are highly likely as a consequence of feeding drought fodder and grain. There is little that can be done to prevent it. Extension and education strategies are to be put in place to prompt people to think about their actions and to take action to minimise potential problems. Procedures for feeding introduced fodder and grain during drought are well publicised (NSW Agriculture 2001b, Michelmore 2003), and landholders and occupiers should be encouraged to adopt a program to minimise the possible spread of weeds from contaminated fodder and grain.

Good farm hygiene and the rational feeding of introduced fodder and grains are the best avoidance procedures. General fodder feeding strategies to reduce the risk of weed introduction and spread include:

- feeding stock in a restricted area and regularly monitor the area for weeds. A small 'sacrificial' paddock may be the best option, preferably located where regular checks can be made after each incidence of rain. Flat arable areas are preferable for this purpose as these usually allow easy access and many control options;
- obtaining as much information as possible about the source of the fodder or grain being brought onto the property; and
- carefully considering where to feed livestock the imported grain and fodder. Cropping paddocks should be avoided, as the risk of introducing herbicide resistant strains of weeds is high.

Additional stockfeed strategies and risk minimisation techniques to be promoted are contained within Appendix 2 (Michelmore 2003).

General livestock and pasture management strategies for landholders to avoid causing and/or exacerbating a weed problem are also well publicised through Agnotes. They include:

- quarantine new or returning livestock for several days so weed seeds can pass through them in a confined area which can be treated later;
- restrict the movement of livestock within the first two weeks after the reintroduction of livestock;
- avoid overgrazing as this creates ideal conditions for weed invasion;
- consider weed management in drought management strategies; and
- undertake best-practice soil management techniques as outlined in Agnote DPI-355 (Jenkins 2002).

## **4.2 Fire**

When large areas have been burnt, stocking at normal rates may severely affect pasture recovery. It may be necessary to overstock selected paddocks to assist regeneration over the rest of the property. Such paddocks probably will require eventual resowing. Regenerating and resown paddocks should be inspected regularly to assess growth and recovery and to identify weed problems early.

Arable areas where the pasture has been destroyed or which are known to have a weed problem should be priority areas for forage oat growing. This will assist in the reduction of potential weed problems as well as providing useful winter feed following fires (NSW Ag fact P2.3.7).

Further information regarding pasture management after fire is contained on the NSW Agfact P2.3.7.

## 5. Strategic Actions

### 5.1 Declaration Changes

To ensure quick response, region-wide declarations should be maintained or sought for high priority weeds potentially brought in via emergency fodder. Table 5 is an initial list of weeds for which regional declarations will significantly improve the speed and efficiency of response. This list is to be updated every two years or after new information regarding potentially problematic weeds is obtained.

To effectively administer the new declarations, additional funding should be sought prior to the declaration changes recommended in Table 5.

Information regarding weed declarations for NSW, ACT and Commonwealth lands is provided in Appendix 1.

**Table 5: Declaration changes**

Common name	Species name	Declaration Changes
fireweed	<i>Senecio madagascariensis</i>	W2 <sup>1</sup> declaration to be sought for Crookwell and Queanbeyan
parthenium weed	<i>Parthenium hysterophorus</i>	W1 <sup>1</sup> declaration to be maintained regionally
St Johns wort	<i>Hypericum perforatum</i>	Declaration to be sought for ACT <i>Note: this is under review as part of the review of ACT weeds legislation. St Johns Wort is currently included on the Pest Plants list</i>
Chilean needlegrass	<i>Nassella neesiana</i>	W2 <sup>1</sup> declaration should be considered for Eurobodalla and Queanbeyan. W3 <sup>1</sup> declaration for Goulburn, Gunning, Mulwaree, Tallaganda, Wingecarribee, Yass, and Yarrowlumla
nodding thistle	<i>Carduus nutans</i>	W2 <sup>1</sup> declaration sought for the Illawarra and Wollondilly. Regional declaration is recommended.  Declaration for the ACT sought.  <i>Note: this is under review as part of the review of ACT weeds legislation. St Johns Wort is currently included on the Pest Plants list</i>
spotted knapweed	<i>Centarea maculosa</i>	W1 <sup>1</sup> declaration to be maintained

<sup>1</sup> See Table 6 (p.35) for declaration categories under the Noxious Weeds Act

Appropriate declarations should also be sought for significant<sup>2</sup> weeds that have seeds or other propagules that are readily spread by floodwater (Table 3 p. 9). Each LCA in the Region should maintain either a W2 or W3 declaration for these species depending on individual LCA circumstances. This will assist in rapid action in controlling new infestations and to some extent slow the downstream spread of these weeds.

## **5.2 Operational and inspectorial procedures**

During drought and immediately after drought, fire and flood, there should be procedures in place that are undertaken as standard practice. These include:

- Issuing a general weed alert (see Appendix 3 p.39 for an example of a weed alert) from councils and NSW Agriculture to all areas at risk. This can be achieved through mailouts, e-mails, rate notices, media, field days, Landcare, Rural Lands Protection Board Offices and appropriate forums (e.g. NSW Agriculture's Community Drought Forums). The procedures manual (see Section 6 p.22) will facilitate this process.
- To the greatest possible extent, all council weed officers should identify the properties in their areas most at risk. These are normally properties that have imported fodder from areas of known weed infestations, such as parthenium weed areas of Queensland. Obviously, this can only occur during relatively small-scale disasters such as flood and fire, as monitoring fodder importation during regional and statewide drought is not achievable given current resources.
- To the greatest possible extent, all properties considered at risk should be inspected as soon as possible after first sightings of weeds.
- Increased inspections across the affected areas are also recommended. For this to occur, additional resources are to be sought (see Section 7 p.24).
- As soon as rain falls, roadsides should be carefully monitored for new weed infestations.

## **5.3 Weed control/replacement**

The highest priority after a disaster is to establish a productive and appropriate ground cover as soon as possible after the event. This will provide the greatest resistance to weed invasion. Where and when weeds do appear it is essential that along with control works (herbicide application, grazing, manual control *etc.*) the treated area must be 'replaced' with appropriate species. This weed control/replacement technique is fundamental to the success of every weed control operation.

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<sup>2</sup> Significant weeds are species that have the ability to dominate pastures or natural areas or degrade the values and uses of land.

The highest priority for weed control is to address new weeds brought into areas through emergency fodder, through floodwaters, or through earth moving machinery or firefighting appliances. Areas affected must be carefully and routinely monitored for new species. Obviously, there will be many colonising species thriving in such disturbed places. These are not as much of a concern and in most cases it may be beneficial to leave these untreated. New species that have the ability to dominate or degrade the values of the land, are to be immediately treated.

#### 5.4 After wildfire

Besides controlling new outbreaks of weeds resulting from wildfire (Table 2 p.7), the highest priority after wildfire should be to treat existing weed populations that are susceptible to follow-up control *i.e.* broom (*Cytisus spp.* and *Genista spp.*), bridal creeper (*Asparagus asparagoides*), lantana (*Lantana camara*), blackberry (*Rubus fruticosus*), gorse (*Ulex europaeus*) and bitou bush (*chrysanthemoides monolifera rotunda*) (Table 4 p.12). It is especially imperative that these species are treated, as they tend to flourish after disasters.

Fire maps produced by NSW Rural Fire Service (RFS) are a good resource in establishing where fires have occurred in the local area. By overlaying fire perimeter maps over weed maps, priorities for weed control can be readily identified.

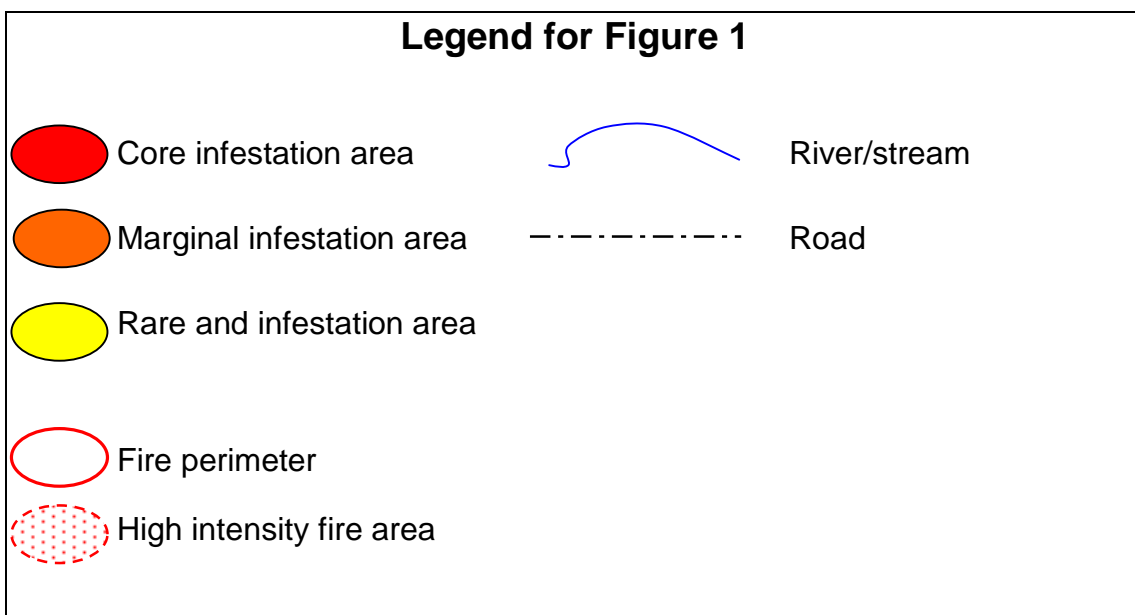
A variety of challenges for weed management are posed after large-scale fires. The greatest challenge is deciding which areas are the priorities. Regional plans for many weeds place emphasis on the control of rare and isolated infestations. Opportunities to eradicate core infestations of weeds that have experienced high intensity fire over a broad area should, however, not be ignored. High intensity fires destroy more of the seedbank, regenerative organs of adult plants, and stimulate more germination of the remaining seedbank. Councils and land managers throughout the Region must be prepared to capitalise on the opportunities provided by high intensity fires to control core infestations. In contrast, follow-up control after a low to moderately intense fire will require a considerable amount of follow up control for many years as there will still be a large seedbank. In this case, initial control on the rare and isolated infestations of these weeds is usually more productive.

Figure 1 demonstrates this concept of prioritisation after wildfire. It displays a fictitious area with broom infestations that have recently been subjected to a wildfire. Priorities for control as indicated within Figure 1 are based on the concepts and strategies as described above. For instance:

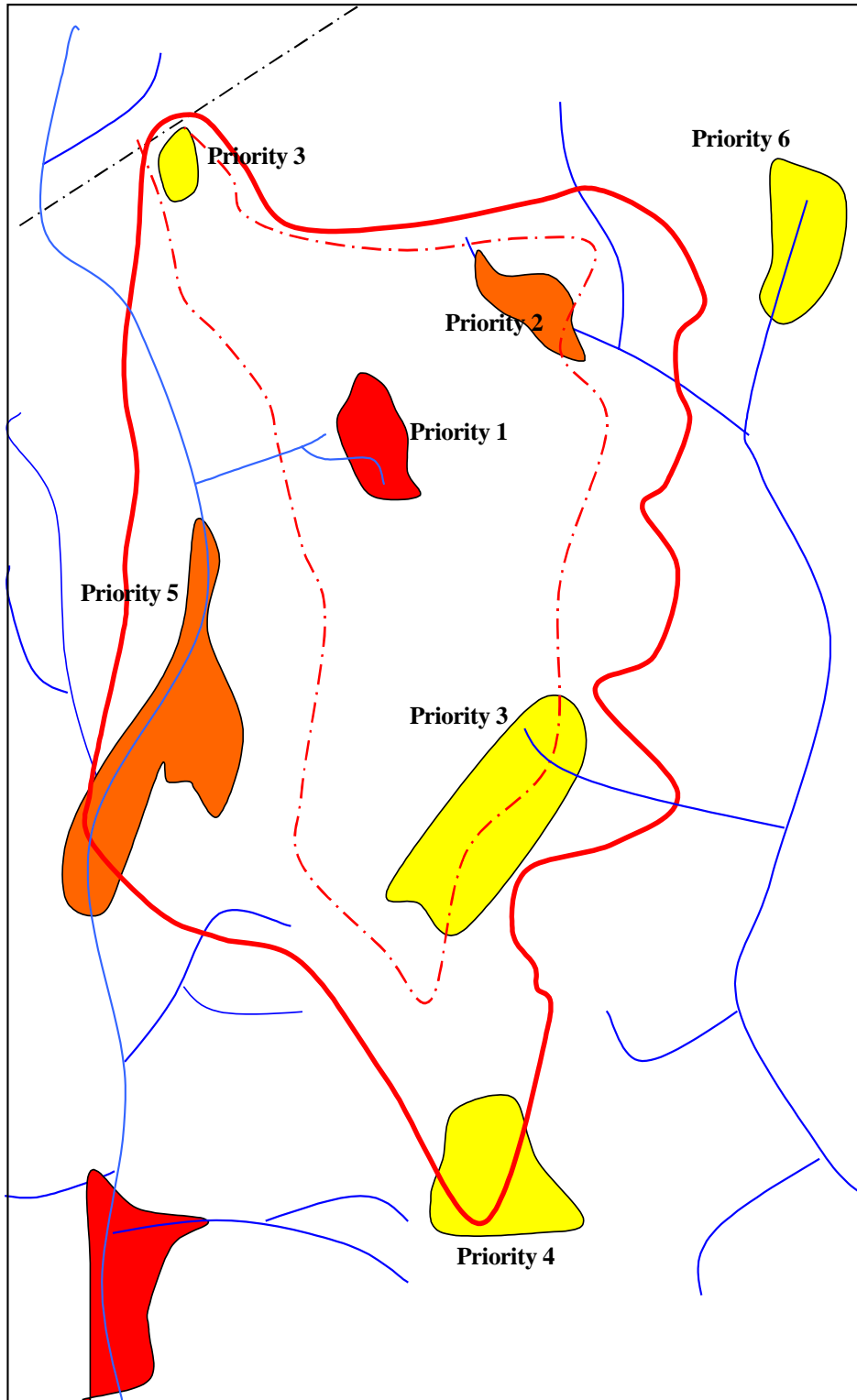
- **Priority 1:** High intensity fire within a core area (and also located topographically high in a catchment).
- **Priority 2:** High intensity fire within a marginal infestation area (and also high in a catchment).

- **Priority 3:** High intensity fire within a rare and isolated infestation.
- **Priority 4:** lower intensity fire within a rare and isolated infestation.
- **Priority 5:** lower intensity fire within a marginal infestation.
- **Priority 6:** no fire, rare and isolated infestations.

Fires are almost an annual occurrence within the region. Each council and land management agencies should consider a scheme that allows funds to be held in reserve to capitalise on weed control opportunities provided by wildfire.



**Figure 1: Prioritising control works after wildfire**



## 6. Education and Extension

### 6.1 Training of weed officers and land managers

Early identification are the first and most important steps in weed control. Training of weed officers and land managers so that they can provide early identification and technical information on new weed species, such as parthenium weed and spotted knapweed is essential. Through cooperative training all council weed officers and land managers should be familiar with weeds that grow in areas that supply emergency fodder, or occur upstream, or occur in neighbouring LCAs.

### 6.2 Extension

The promotion of a 'buyer beware' culture, and education on post disaster feeding and weed management strategies is considered more important and feasible than relying on growers' assurances or any form of importation regulation (*i.e.* hay police). A major emphasis of the Strategy is therefore, placed on education rather than regulation.

As mentioned in Section 1 p.13 there is a substantial amount of extension material available to landholders regarding risk minimisation practices. The broad-scale dissemination of this material to the targeted audience is seen as critical. This Strategy does not seek to 're-invent the wheel', but to improve the efficiency of information dissemination. The following actions are recommended:

- Agnotes regarding fodder-feeding, pasture and soil management, and recovery methods during and after drought (including droughts caused by fires and floods) should be condensed and compiled into one package or manual and/or brochure. These should be;
  - sent as a mail out to affected landholders,
  - as a handout at field days or forums such as the NSW Agriculture Community Drought Forums, and
  - as an information item which can be sent to appropriate media for inclusion as articles (*e.g.* local newspapers, 'The Land' newspaper and advertised on the radio).
- Seek support from fodder and grain producers in providing information regarding fodder-feeding techniques to customers. An A4 information sheet suitable for photocopying with similar information to Agnote DPI-351 and DPI-349, should be developed.
- After each disaster event, local newspapers, 'The Land' and radio are to be contacted to run articles about weed management practices during and after disasters.

- Encourage nurseries, who sell their products under the 'Bush Friendly Nursery Scheme', to sell weed-free (certified) hay.
- Promote and make freely available, existing Identification booklets (such as WEEDeck, Weeds of the NSW South Coast) and fact sheets, to Councils, Landcare, land holders and occupiers.

### **6.3 Regional Weed Extension Officer**

Many of the actions and strategies outlined in this Strategy cannot be feasibly achieved within current resources. For the successful implementation of the Strategy, additional resources need to be made available across the Region.

The need for a Regional Weed Extension Officer (RWEO) has been highlighted in the Regional Weed Strategy (currently in development). In addition to the duties listed in the Regional Weed Strategy, the Regional Weeds Extension Officer will provide the following disaster weed management tasks and services:

- Submit applications for additional funding and resources when opportunities arise;
- Develop and distribute post-disaster weed manual and brochure;
- Develop fodder feeding and risk reduction brochures and pamphlet;
- Cooperate with fodder and grain feed suppliers to distribute fodder feeding and risk reduction brochures (or relevant Agnotes) to all purchasers of emergency fodder;
- Implement cooperative training programs in species identification for weed officers, catchment officers, Landcare coordinators, and agronomists and selected field staff of NSW land management agencies. This training will focus on weeds potentially introduced and spread in emergency fodder or downstream in floodwaters;
- Raise awareness in all land management authorities of weed control strategies after disasters;
- Assist in inspectorial and educational duties where necessary after disasters; and
- Media liaison (see Section 6.2 p.22).

## **7. Assistance and funding opportunities**

For the successful implementation of the Strategy, additional resources have to be obtained above and beyond that which currently exists. This section details possible funding opportunities associated with weed control after natural disasters.

The Natural Disaster Relief Arrangements (NDRA) is the only consistently available funding resource, although, the likelihood of receiving funding through this scheme is uncertain (see below) and does not apply to drought (see Section 7.2). For this reason it is imperative to lobby NSW Agriculture, State Government, and local councils for additional resources when they are required. Additional resources are required for:

- the post disaster extension initiatives outlined in Section 6 (p.22);
- extra staff to undertake the essential inspections immediately after drought, flood and fire;
- the control of weeds that have been identified within the strategy as a high priority for control after disasters (Section 3 p.10); and
- extra control operations that are anticipated after a disaster event (see Sections 2.1, 2.2, and 2.3).

The Regional Weed Extension Officer (if funded) is to have the responsibility for lobbying for extra resources at a regional level and at a local level with the support and assistance from respective LCAs. In the interim, this responsibility is to fall with the Southern Tablelands and South Coast Noxious Plant Committee (ST&SCNPC).

### **7.1 Natural Disaster Relief Arrangements**

After a flood or fire event, government assistance is available under the Natural Disaster Relief Arrangements (NDRA). Full details and contacts for these programs are available from NSW treasury and the Department of Transport and Regional Services (Commonwealth) and are usually published during or immediately after a disaster event.

This joint State-Federal assistance package provides a range of assistance measures for landholders, including emergency funding for replacement of household items, subsidies for the transport of fodder and livestock deemed necessary as a result of the disaster, and low-interest loans. Other assistance is available for local councils and other organisations. Eligible relief measures provided by the States and Territories that qualify for Commonwealth assistance under NDRA are ([www.dotars.gov.au/ndr/arrangements.htm](http://www.dotars.gov.au/ndr/arrangements.htm)):

- grants for relief of 'personal hardship and distress', such as the provision of emergency food, clothing and accommodation, essential housing repairs, or the replacement of essential household goods - eligibility for which may vary between States and Territories;

- concessional interest rate loans to farmers, small business operators and voluntary non-profit bodies to replace assets that have been significantly damaged in an eligible disaster. Recipients must have no reasonable access to commercial finance and, in the case of farmers and small business operators, have reasonable prospects for long-term viability;
- payments to restore or replace essential public assets which have been damaged as a direct result of an eligible disaster to a pre-disaster standard; and
- payments for providing financial and psychological counselling to people who have experienced an eligible natural disaster.

It is uncertain whether assistance in the past has extended to weed management. However, as the sustainable use of land should be considered an asset, weed management falls within a number of the relief measures listed above.

Additional funding should be sought through NDRA when available for the following initiatives:

- Employment of extra inspectors and weed officers for areas that have experienced disasters. If circumstances make this impractical, the opportunity for neighbouring weed officers and equipment moving within the region to assist disaster affected LCAs should be investigated;
- Additional weed control operations;
- Awareness raising and extension including possible production of a customised WEEDeck; and
- Increased surveillance and control along roadsides.

## **7.2 Relief funding arrangements during and after drought**

Since the implementation of the National Drought Policy in 1992, drought has not been classified as a 'natural disaster', and therefore government assistance in the form of 'disaster relief' may not be provided in drought circumstances. The rationale behind this decision is that drought is an ever-present risk in the unreliable Australian environment, and existing government assistance programs were not encouraging landholders to develop 'drought preparedness' strategies. Landholders are now expected to develop their own risk management strategies that now recognise the frequency of dry times and drought, and which protect their natural resources and stock (NSW Agriculture 2002).

During the 2002/2003 year, federally funded drought relief packages were available to affected farmers and certain small businesses. Whilst still emphasising droughts as the natural cycle of farming in Australia, the exceptional circumstances (*i.e.* severity and extent) of this particular drought

led to New Income, Business Assistance and interest rate relief being available to affected landholders and business people.

In addition, a \$10 million Drought Recovery round of the Australian Government Envirofund was made available for projects that aim to protect the land, water, vegetation and biodiversity resource base from the effects of drought, and to assist in recovery. Applications for this have since closed.

\$1 million dollars was also available through the pest management grants program to assist farmers, land management authorities, and communities to control pest animals and to reduce the total grazing pressure on drought affected vegetation.

Currently, the availability of these funds cannot be predicted or prepared for in a Strategy such as this. An ability to capitalise on these one-off funding opportunities is essential to combat the expected increase of weeds after a drought. The Southern Tablelands and South Coast Noxious Plants Committee or individual weed officers cannot be expected to meet the usually short deadlines for the required funding submissions. If funded, the Regional Weed Extension Officer (Section 6.3 p.23) would perform this function. The RWEO would, among other duties, anticipate, search for, and submit applications for additional funding opportunities for the region as well as local areas.

### **7.3 Changes to the administration of annual operational and inspectorial budgets**

The need for administration and policy change to enable the 'rolling-over' of unexpended funds into the following year's budget has previously been highlighted (Section 2.1 p.4).

The anticipated weed population explosion in the years following drought usually far exceeds what can be managed with expected annual operational funding. Funding administration policies must be made more adaptable so that unexpended funds as a result of drought can be rolled over and used as additional funding to combat the expected post disaster increases in weed infestations. LCAs through the ST&SCNPC are to lobby for these changes as a priority.

### **7.4 Annual disaster funds**

The importance of rapid action is paramount to effective weed management after disasters. Reasons for this have been detailed throughout this Strategy. To facilitate rapid action, a reserve of funds held by the Committee or NSW Agriculture and used when and where appropriate is recommended.



ACTION		Performance Indicator	Who is to be responsible (add others involved)	Objective number <sup>3</sup>
3*	a) Undertake species identification training for Weeds Officers, Catchment Officers, Landcare Coordinators and agronomists and selected field staff in land management authorities. This is to focus on weeds potentially spread in emergency fodder or downstream in floodwaters and for staff in areas affected by disasters	a) 80% of targeted people can distinguish weeds listed throughout this strategy prior to January 2006.	<b>NSW Agriculture, RWEQ</b>	1 and 2
4	a) In cooperation with producers of grain and fodder, Agnotes DPI-351 (weed strategies following drought, fire and flood) and DPI-349 (Weeds – a threat to recovery) is to be disseminated to all purchasers of emergency fodder. b) Brochure based on this Agnote, but focussing on weed prevention measures, is to be developed and used instead of the Agnote.	a) Producers of grain and fodder to be approached by July 2004. Agnotes to be included with every purchase of emergency fodder and grain. b) Brochure developed and used by Dec 2004.	<b>RWEQ</b>	1, 2, 3, and 5
<b>Operational actions – drought (including drought caused by fire and flood)</b>				
5	a) During drought situations (including drought caused by fire and flood) council weed officers are, to the greatest possible extent, identify properties in their area most at risk. These will be properties that have imported fodder from areas of known weed infestations. <i>Note: This can only be achieved if the total area of the disaster-affected land is small enough to enable the Weed Officer to monitor the importation of emergency fodder. This is not achievable during regional and statewide droughts</i> b) Inspect identified properties as soon as possible after rains c) Any new infestations as a result of fodder feeding are to be treated within the same season and eradicated within 1 year of detection	a) Properties are identified b) Annual reports show inspections have occurred. c) New infestations eradicated within a year of detection.	<b>LCAs</b>	1, 3 and 6

ACTION		Performance Indicator	Who is to be responsible (add others involved)	Objective number <sup>3</sup>
6*	<p>a) Undertake increased inspections of drought affected properties as soon as possible after rains.</p> <p><i>Note: Funding for employing extra inspectors is required to achieve this (see Section 7 p.24)</i></p>	a) At least 25 % of properties within LCAs are to be inspected within the first year of the drought officially breaking. This is to be verified in annual reports	LCAs	1
<b>Operational actions – fire</b>				
7*	<p>a) By overlaying RFS fire perimeter maps with local weed maps, identify and prioritise areas and species for control (see Section 3.2 p.10)</p> <p>b) Undertake priority control works after fire.</p>	<p>a) Maps produced and verified in annual reports.</p> <p>b) Control works detailed in annual reports</p>	LCAs	3, 4, and 6
<b>Operational Actions - floods</b>				
8	<p>a) Seek cooperation with Landcare groups to undertake weed surveillance of flooded areas.</p> <p>b) Any new regionally significant weeds that are brought into an area from floodwaters are to be treated within 6 months and eradicated within 1 year of detection</p>	<p>a) Within 4 months of a major flood event, Landcare groups within the effected areas have been approached to undertake weed surveillance programs within affect areas.</p> <p>b) Actions are verified in Landcare annual reports.</p>	LCAs, CMB, Landcare	2 and 6
<b>Operational Actions - roadsides</b>				
9	<p>a) As soon as rain falls, roadsides affected by disasters should be inspected every four weeks.</p> <p>b) Any new infestations are to be treated within the same season and eradicated within 1 year of detection</p>	<p>a) Annual reports show inspections have occurred.</p> <p>b) New infestations eradicated.</p>	LCAs	3, and 6
<b>Prevention, regulation and rehabilitation</b>				
10	a) A general weed alert should be publicised by councils in all areas of risk	a) Actions are detailed in annual reports	LCAs	1 and 3
11	<p>a) *Regional declarations as outlined in Table 5 are to be sought for new and emerging weeds that could potentially be brought into an area via emergency fodder feeding (Section 5.1)</p> <p>b) Region wide W2 or W3 declarations are to be sought for weeds transported through floods (Section 2.3 and Table 3).</p>	<p>a) Declarations as outlined in Table 5 are in effect by July 2005. The list of potential weeds through contaminated fodder is updated and relevant declaration changes are made every two years (see Section 5.1).</p> <p>b) W2 or W3 declarations are in effect by July 2005.</p>	ST&SCNPC, LCAs, NSW Agriculture	1

<b>ACTION</b>		<b>Performance Indicator</b>	<b>Who is to be responsible</b> (add others involved)	<b>Objective number<sup>3</sup></b>
<b>Funding and resources</b>				
12	<ul style="list-style-type: none"> <li>a) *Lobby NSW Agriculture and Councils to change administrative procedures to enable unexpended operational and inspectorial funds (due to adverse climatic conditions) to be rolled over into the next financial year.</li> <li>b) Lobby NSW Agriculture to establish regional or statewide annual disaster funding scheme.</li> <li>c) *When available, submit funding applications for additional resources through appropriate schemes such as NDRA, Drought Recovery Envirofunds <i>etc.</i></li> </ul>	<ul style="list-style-type: none"> <li>a) Letter from ST&amp;SCNPC sent to NSW Agriculture and respective councils (where appropriate) prior to November 2003.</li> <li>b) Letter from ST&amp;SCNPC sent to NSW Agriculture prior to March 2004.</li>   <li>c) Funding applications have been sent prior to closing dates.</li> </ul>	<b>ST&amp;SCNPC, NSW Agriculture RWE0 (action c)</b>	7

<sup>1</sup>The name of this Officer may be changed

## **9. Conclusion**

When faced with the usual financial difficulties resulting from flood, fire and drought, making weed control a priority will be an enormous challenge. Methods to reduce the threat of weed invasion after natural disasters are therefore to focus on prevention rather than control.

The Strategy places an emphasis on prevention through education and extension. Development of identification skills, post disaster pasture and grazing management, provision of education/extension programs, and promotion of low-risk fodder feeding techniques are essential if the Strategy is to succeed.

It is anticipated that the application of the actions contained throughout the Strategy and summarised in Section 7, should reduce existing weed populations and reduce the risk of new weed populations establishing in disaster affected areas. Efforts to restrict or reduce the establishment of new weed populations will benefit the agricultural industry, the environment and the community and will save industry both control and opportunity costs.

## 10. Resources

### 10.1 Publications

A list, and in some cases identification, of potential weeds from the southern and eastern states of Australia can be obtained by referring to the following publications:

Auld, B.A., Medd, R.W. 1987 *Weeds: An illustrated botanical guide to the weeds of Australia*. Inkata Press, Melbourne

Blood, K. 2001 *Environmental weeds: A field guide for SE Australia* CRC Weed Management Systems

Lamp, C. and Collet, F. 1989 *Field Guide to Weeds in Australia*, Inkata Press

Muyt, A 2001 *Bush Invaders of South-East Australia*. RG & FJ Richardson

Parsons, W.T. and Cuthbertson, 2000 *Noxious Weeds of Australia* Inkata Press, Melbourne and Sydney revised edition November

Wilding, J.L., Barnett, A.G., and Amor, R.L. 1986 *Crop Weeds*. Inkata Press, Melbourne and Sydney

WEEDeck custom-made National Pocket Guide for Weed identification (for more information: Sainity and Associates Pty Ltd <mailto:geoff@sainty.com.au>)

### 10.2 Websites

[www.esc.nsw.gov.au/weeds/](http://www.esc.nsw.gov.au/weeds/): For an expanded version of the brochure 'Weeds of the NSW South Coast: A guide to identification and control'

[www.agric.nsw.gov.au/weeds/](http://www.agric.nsw.gov.au/weeds/)

[www.agric.nsw.gov.au/noxweed/](http://www.agric.nsw.gov.au/noxweed/)

[www.nswweedsoc.org.au](http://www.nswweedsoc.org.au)

[www.ento.csiro.au/research/weedmgmt/weedmgmt.html](http://www.ento.csiro.au/research/weedmgmt/weedmgmt.html): provides information on biological control of weeds

[www.nre.vic.gov.au](http://www.nre.vic.gov.au): Follow the links to Landcare notes of weed profiles available online

[www.weeds.org.au/index.html](http://www.weeds.org.au/index.html): search facility to source information about specific weeds, including identification features

[www.ea.gov.au/about/siteindex.html](http://www.ea.gov.au/about/siteindex.html): links to weed sites

### 10.3 Agnotes

These are readily obtainable through the Internet at [www.agric.nsw.gov.au](http://www.agric.nsw.gov.au).  
Relevant Agnotes include;

- DA1-206 (2000): *Impact of Drought* by McKiernan, B.
- DPI-351 (2001): *Weed Strategies following drought, fire and flood* by Trounce, B. and Dellow, J.
- P2.3.7 (1997): *Pasture recovery after bushfires* by McGowen. F.
- AO.1.3 (2002): *Risk management for stockowners in times of fire and flood* by Bowler, J.
- DAH-6 (2002): *Drought Strategies for the livestock producers* by Makwick, G.
- M1.6 (2000): *Agistment guidelines* by Davies, L. and Sell, I
- DAI155 (2000): *Drought Hints for a beef cattle enterprise* by Clayton, E., Blackwood. I., and McKiernan, B.
- DPI-349 (2001): *Weeds – a threat to drought recovery* by The Weeds Subprogram
- DPI-355 (2002) *Soil Management following drought* by Abigail Jenkins
- NSW Agriculture (2002) Information on importing hay into NSW from interstate

### References

Briese D., Campbell M., and Faithful I. 2000 *Best practice management guide 7 St Johns wort, Hypericum perforatum*. CRC Weed Management Systems

Brown, R. and Peet, R. 2003 January edition of *Ecology*

Brown, S.M., and Worsham, D.A. 1994 Impact of drought on weed management. North Carolina Cooperative Extension Service, North Carolina State University, Raleigh, North Carolina.

Chemcert (NSW) Ltd. 1999 Chemcert chemical user training program – reference manual

Downey, P.O. 1999 *Fire and weeds: a management option or Pandora's box?* Proceedings of the Australian Bushfire Conference Albury, Australia 7-9 July 1999.

Michelmore, M. 2003 *Reducing weed dispersal*. NSW Agriculture, Goulburn. Unpublished

Natural Resources and Mines 2001. *NRM Facts pest series – Lantana*. Queensland Government.

NSW Agriculture 2001 *Agnote DPI-349 Weeds a threat to drought recovery*. NSW Agriculture, Weeds subprogram, pastures and rangelands, orange

NSW Agriculture 2001b *Agnote DPI-351 Weed strategies following drought, fire and flood*

NSW Agriculture 2002 *Agnote DPI-355 Soil management following drought*

Tu, M., Hurd, C., and Randall, J.M. 2001 *Weed Control methods Handbook: Tools and techniques for use in natural areas*. Wildlands Invasive Species Program. The Nature Conservancy

Vranjic, J. 2000 *Best practice management guide 3: Best practice management guide for environmental weeds - Bitou bush, Chrysanthemoides monilifera ssp. rotunda* CRC Weed Management Systems

Willis 2000 *Best practice management guide 6 Bridal Creeper, Asparagus asparagoides*. CRC Weed Management Systems

## Appendix 1: Declarations under the State, ACT and Commonwealth legislation

In New South Wales, noxious weeds are declared by the order of the Minister for Agriculture under the *Noxious Weeds Act 1993* (NWA). NSW Agriculture administers the Act, together with other legislation related to weed management. The Act also established the Noxious Weeds Advisory Committee (NWAC) which makes recommendations to the Minister, plant species to be declared noxious.

Weeds declared under the *Noxious Weeds Act 1993* are referred to as noxious weeds and may be either environmental or agricultural. The *Noxious Weeds Act 1993*;

- identifies noxious weeds and specifies control measures;
- specifies the duties of land managers, including private occupiers, public authorities and local Control Authorities (representing local government) in controlling noxious weeds; and
- makes it an offence not to control noxious weeds.

The *Noxious Weeds Act 1993* classifies declared weeds into four main categories, each requiring different control measures (Table 6).

**Table 6: Categories under the *Noxious Weeds Act 1993***

Category	Description	Action
W1	Limited distribution, or does not yet occur in the State, but poses a serious threat to agriculture, the environment or the community.	The presence of the weed on land must be notified to the local control authority (within 3 days) and the weed must be fully and continuously suppressed and destroyed
W2	Poses a threat to agriculture, the environment or the community, and has the potential to spread to other areas. For a new declaration the local Control Authority must have a program to treat and enforce the control of all infestations, and to continuously suppress and destroy all infestations as a feasible objective	The weed must be fully and continuously suppressed and destroyed

Category	Description	Action
W3	Poses a threat to agriculture, the environment or the community, and has the potential to spread to other areas, but it is so widespread that total suppression and destruction is impractical. For a new declaration the LCA must have a program to contain the spread and to reduce the area and density of the infestations.	The weed must be prevented from spreading and its numbers and distribution reduced
W4	Poses a threat to agriculture, the environment or the community and for which a specific action is required	The actions specified in the declaration must be taken in respect of the weed

Within the ACT, the Minister under the *Land (Planning and Environment) Act 199* declares 'Pest Plants'. The Act also provides for the making of orders, in respect of pest plant, either generally or in a specific area. The ACT Weeds Working Group (ACTWWG) and the ACT Flora and Fauna Committee recommends plants to be 'Declared' to the minister. Once a plant is declared to be a pest, the Minister must arrange for the preparation of a plan for the control of the pest plant.

On Commonwealth Land (Booderee National Park and Department of Defence Land) legislation is a bit more complicated. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EP&BC Act)* regulates significant environmental impacts on species and communities listed as threatened under this Act. It also identifies key threatening processes for which action plans are to be developed. Whilst many vertebrate pests are listed (foxes, goats etc.) there are currently no impacts of pest plant species listed as a threatening process (EA website 2002). Therefore, no comparable noxious weeds list exist under this legislation. The South Coast Weed Management Plan for the Department of Defence (ERMS 2001), however, states NSW legislation (*Noxious Weeds Act 1993*) will be applied to Defence lands. In addition, the Draft management Plan for Booderee National Park states that priority weed control will be based on the Shoalhaven Noxious Weeds list (Fortescue pers.comm. 2002) under *the Noxious Weeds Act 1993*.

## **Appendix 2: Extracts from Michelmore, M (2003)**

### **Stock feed and the dispersal of weeds**

Stock feed either moves within a property or between properties. To ensure that weeds are not moved in fodder insist that best practice, as suggested in Box 1, take place.

People often take desperate actions to keep stock alive during droughts or after fire or floods. Poor quality hay is often moved long distances. A Code of Practice would be impossible to enforce.

**Take home message:** Weed seeds will disperse in fodder, especially during a drought. There is not much we can do to fully prevent it, but we can prompt people to think about their actions and to take action to minimise any potential problems. We all must be weed aware.

#### **Box 1: Management of weeds in stock feed**

- Control weeds in the fodder paddock prior to harvest. (In some cases the weed may not be declared noxious in the region where the fodder is grown).
- Segregate contaminated fodder
- Ensure contaminated fodder is not sold, or is sold locally or to feedlots or abattoirs.
- Fodder sellers fully describe their product, including, quality, contaminants and weeds.
- Fodder buyers only buy from known sources
- Fodder buyers ask for a description of the product
- Fodder buyers inspect the product at purchase
- Loads are covered during transport
- Inspect fodder when feeding out
- Feed out in home yards or other areas which can be readily monitored for new weeds
- Hold stock which have eaten contaminated feed for 14 or more days (most seeds come out by day 7, 1% of seeds are still coming out at day 14, and there may still be an occasional seed after day 20).
- Inspect areas where contaminated fodder has been fed out regularly and for several years
- Control all new weeds
- Consider selling stock to a feed lot instead of buying fodder

## **Stock and the dispersal of weeds**

In the perfect world, farm born stock will be grown out on farm and sold for slaughter, stock from weedy paddocks will not move to clean paddock. But in our imperfect world the best-practices suggested in Box 2 may be reasonable.

**Take home message:** Mostly, landholders are aware of weed seeds on the outside of stock – they can generally be seen. But weed seeds inside stock can be managed. Its time to take more care with stock movement decisions. We all must be weed aware.

### **Box 2: Management of weeds with stock**

- Control weeds in the paddock prior to seed set.
- Segregate stock from weedy paddocks.
- Control weeds on roadsides prior to driving them.
- Sell stock from weedy paddocks to either abattoirs, feed lots or to similarly weedy areas.
- Shear sheep, comb cattle and feed stock in clean paddocks for 14 days prior to moving to general purpose paddocks
- Control all new weeds.
- Follow similar steps for agistment decisions.

### **Appendix 3: Example of Weed Alert**

**\*\*\*PARTHENIUM WEED ALERT\*\*\***

All Council Weeds Officers and outdoor staff are urged to be vigilant for new outbreaks of Parthenium Weed.

A number of new outbreaks have recently been discovered in both the north and the south of the state. All outbreaks, with one exception have occurred on roadsides. The outbreaks in the north of NSW appear to have been germinated by widespread rainfall in February.

Weed Officers should concentrate surveillance on main roads and major trucking routes

Any landholder or dealer who is known to have received hay or feed grain from Queensland should also be contacted and their property inspected

All new discoveries must be reported to your Noxious Plants Advisory Officer or Regional Weed Control Coordinator.

For further information please contact Philip Blackmore at Armidale by telephone or email

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