Meeting objectives of the Australian Weeds Strategy through collaborative management of icon weed species: from the national to the local level

Hillary Cherry[1], Peter J. Turner[1], Nicole Strehling[2] and Drew English[3]

[1] Pest and Ecological Management Unit, National Parks and Wildlife Service, NSW Office of Environment and Heritage, PO Box 1967 Hurstville NSW 1481, Australia

[2] Northern Rivers Catchment Management Authority, PO Box 228, Kempsey NSW 2440, Australia

[3] Conservation Volunteers Australia, PO Box 1072 Civic Square ACT 2608, Australia

(hillary.cherry@environment.nsw.gov.au)

Summary   The Australian Weeds Strategy (AWS) identifies weed management priorities in Australia under three goals; 1) prevent new weed problems, 2) reduce the impact of existing priority weed problems, and 3) enhance Australia's capacity and commitment to solve weed problems. The Weeds of National Significance (WoNS) initiative identifies a number of species that are considered some of the worst weeds in Australia due to their invasiveness and impacts. WoNS are the focus of nationally coordinated, strategic management. WoNS strategic plans incorporate key goals of the AWS, as well as state, regional and local priorities. Common goals increase the support for action, and clear priorities help ensure action is strategic and effective. As a result, weed managers from national to local levels are supporting and achieving AWS goals. While WoNS is largely a single species approach, the lessons learned are common to many weeds, and increase the ability for strategic and holistic weed management. This paper illustrates how WoNS activities contribute to achieving AWS objectives, while providing outcomes that can benefit management of all weeds. This contribution is only possible due to the highly collaborative approach used to manage these 'icon' weed species.

Keywords   Weed management, Weeds of National Significance, Australian Weeds Strategy.

INTRODUCTION

Invasive plants, or weeds, cause significant negative impacts to Australia's biodiversity and production values (Sinden *et al.* 2004). Weeds and other invasive species are biosecurity threats that are most effectively managed in a collaborative manner across an integrated pre-border, border and post-border continuum (Beale *et al.* 2008). Management actions in this biosecurity continuum include strategic use of prevention, eradication, containment and asset protection to prevent or reduce the impacts of weeds.

The Australian Weeds Strategy (AWS) aims to '*provide guidance for national leadership to ensure all Australians can work together against the serious impact of weeds' (*NRMMC 2006). Agreed by all levels of government, the AWS identifies weed management priorities, with the goals of preventing new weed problems and reducing weed impacts on environmental, social and economic assets through collaborative action. The AWS encourages strategic management across a continuum from preventing new incursions to reducing the impact of existing weed problems.

The Weeds of National Significance (WoNS) initiative identifies a number of widespread species that are considered some of the worst weeds in Australia due to their severe impacts and ability to spread. The WoNS species are the focus of nationally coordinated research and management, supported by partners from the national to local level. Each WoNS has a national strategic plan developed in conjunction with national, state, regional, and local groups, ensuring objectives are relevant to all partners. Implementation of plans is driven by a national coordinator and management group, which facilitate ongoing communication by building networks, promoting nationally strategic investment in weed control, and encouraging cross-tenure partnerships to deliver actions. This process recognises that WoNS are national problems that can be effectively addressed using a national approach that incorporates local and regional priorities to achieve long-term success.

Development and implementation of national WoNS strategic plans contributes to strategic action 2.2.1 of the AWS, '*develop and implement national plans for managing priority weeds and weed problems*', but the wide range of management actions for each WoNS, and the inclusive nature of WoNS partnerships, has contributed to implementation of many other AWS objectives. The WoNS model uses icon species to deliver actions that can provide broadly applicable benefits for weed management and contribute to implementation of the AWS. This paper provides examples of how WoNS activities contribute to achieving AWS goals using a selection of AWS objectives.

AWS Goal 1: Prevent new weed problems   While WoNS are widespread weeds in parts of Australia, there is still the need to prevent their spread into

uninvaded areas. This involves developing prevention and early detection mechanisms, as well as eradication or containment programs for priority outlier infestations.

Objective 1.2: Ensure early detection of, and rapid action against, new weeds The aquatic WoNS partners have developed standardized surveillance protocols and early detection tools, including consistent training packages, for aquatic weeds. These are being used by weeds officers and community groups to detect and manage new infestations of many species of water weeds. In addition, lantana (*Lantana camara* L.) and prickly acacia (*Acacia nilotica* ssp. *indica* L.) are being used as trial species to investigate the use of remote sensing and other aerial mapping and monitoring techniques that may enable more efficient weed detection and management.

Objective 1.3: Reduce the spread of weeds to new areas of Australia The WoNS initiative works collaboratively with national groups to identify and manage weed pathways and prevent spread. For example, WoNS partners support and promote Nursery and Garden Industry of Australia initiatives, such as 'Grow Me Instead', and the development of a nursery industry weed risk assessment tool, which aim to remove weeds from sale or trade. In conjunction, awareness raising through extensive WoNS networks better equips the community to be alert to new weed threats.

Weed hygiene is also a focus for WoNS. For example, partners working to prevent the spread of parthenium weed (*Parthenium hysterophorus* L.) have installed weed wash down bays at key border crossings to ensure trucks and machinery do not spread weed propagules. These wash down facilities improve weed hygiene and prevent spread of parthenium and other weeds to clean areas, as well as raise awareness of weed spread in transportation corridors and with travelers.

Goal 2: Reduce the impact of existing priority weed problems Where weeds are widespread, such as in core infestations, the focus of management action is likely to be on protecting priority assets from the impact of weeds. The WoNS initiative has developed prioritisation tools and supporting processes that improve ability to target weed control where it is likely to achieve the best and most cost-effective outcomes.

Objective 2.1: Identify and prioritise weeds and weed management problems and determine their causes Risk or cause analysis driven by implementation of WoNS strategic plans has led to action on priority weed problems, including development of tools to address those problems. Willows (*Salix* spp.) partners identified the need to ensure removal of high risk willows (*i.e.* those most able to cause environmental impacts) as a priority. In response, partners developed a risk analysis toolkit that contains identification and planning tools, including interactive maps, which allow land managers to assess risk from the national to local level, and prioritise action to ensure resources are directed to controlling high-risk willows.

Effective strategies are also developed to address management issues for conflict weeds and implement process to resolve them. The aquatic WoNS partners work closely with the aquarium industry to identify the drivers behind the use of weedy species, and provide non-weedy alternatives. Education programs have been developed to resolve a variety of cultural issues, such as the movement of alligator weed (*Alternathera philoxeroides* (Mart.) Griseb.) and other weeds as food plants; social issues, such as the use of blackberries (*Rubus* spp.) in permaculture; and economic issues, such as the use of hymenachne (*Hymenachne amplexicaulis* (Rudge) Nees) and other grasses, which have a production benefit but cause serious environmental damage. These examples can be used as templates for other weed species that elicit similar conflicts.

Objective 2.2: Implement coordinated and cost-effective solutions for priority weeds and weed problems WoNS partners are committed to providing information and tools to improve management practices, and ensuring those resources are widely promoted and adopted. Comprehensive best practice management manuals developed for WoNS act as 'toolkits' to assist weed managers. These guides also contain information relevant to multiple weed species, such as hygiene protocols, advice for undertaking control in various ecosystems, mapping and monitoring guidance, and advice on holistic weed management. Other broadly applicable best practice tools developed under WoNS include a weed hygiene DVD for slashers and other machinery, developed using Chilean needle grass (*Nassella neesiana* Trin.et Rupr.) as a model, and the lantana decision support tool, which promotes an holistic management approach.

WoNS listing also provides a focus for biocontrol research and implementation. For example, the '*community guide to implementing biological control*', which assists community groups in raising and rearing biological control agents, was developed using bitou bush and boneseed (*Chrysanthemoides monilifera* (L.) Norl.) as a model, but can be used with a number of other biological control agents for other weeds.

A range of other weed research is encouraged and promoted under the WoNS initiative. WoNS are

used as example species for research trials, from the use of unmanned aerial vehicles, or 'quad copters', to search for rubbervine (*Cryptostegia grandiflora* R. Br.) and other weeds in remote areas, to seed research using multiple WoNS that aims to increase ability to understand and manipulate weed seed persistence.

Objective 2.3: Develop approaches to managing weeds based on protection of values and assets   Under the direction of the National Lantana Management Group, a national '*Plan to Protect Environmental Assets from Lantana*' was developed that identifies the threats posed by lantana to biodiversity and provides site-based approaches to protect biological assets. This involves assessing and prioritising native species at risk, and prioritising sites for lantana control based on the ability to achieve control and the likelihood of protecting biodiversity most at risk, irrespective of land tenure. This approach is broadly applicable to multiple weeds. For example, the approach was adopted at a state-level for all widespread weeds in New South Wales (NSW) under the Biodiversity Priorities for Widespread Weeds (BPWW; DPI and OEH 2011). The BPWW planning framework is being implemented by multiple stakeholders to help reduce the impacts of weed species listed as Key Threatening Processes under the NSW *Threatened Species Conservation Act 1995* (see Turner *et al.* these proceedings).

To better address weed threats at the landscape level, bitou bush partners have worked with researchers to develop restoration guidelines for coastal dune and littoral rainforest communities (French 2010). While the first iteration of these guidelines focuses on plant communities in southern NSW, they provide a template and can be used to develop guidelines for community and regional groups to monitor the response of native biodiversity, at local and catchment scales, to improve long-term biodiversity outcomes following weed management.

Goal 3: Enhance Australia's capacity and commitment to solve weed problems   A key strength of the WoNS initiative is the ability to use its vast network to determine management needs, and then address gaps by developing and delivering improved tools, systems and information to increase the capability to better manage weeds.

Objective 3.1: Raise awareness and motivation among Australians to strengthen their commitment to act on weeds   The WoNS initiative extends and adds value to existing weed management networks. These extensive networks and communication channels are used to encourage people to share their knowledge, engage with others and learn new information that will allow them to better manage weeds. Workshops, field days and other events run by the WoNS partners provide information, but also collect information, from all stakeholders, which builds the combined knowledge base. All actions take a holistic approach and work to incorporate community, local and regional needs. As a result, the WoNS initiative energises local and industry champions to take actions on weeds because their priorities are integrated with national priorities.

Community achievement in weed management is recognised and valued in the WoNS initiative. All WoNS have national management groups with community members that provide advice and ensure community needs and priorities are identified and supported. The gorse (*Ulex europaeus* L.) program has engaged community Landcare champions as custodians of 'Gorse Batons' as part of a toolkit to ensure state and regional groups fulfill their commitment to gorse eradication. WoNS partners also strive to continually raise weed awareness by supporting Weedbusters and Weed Warriors programs, and developing tools like the *Weeds Attack!*, an electronic resource that engages primary schools students in weed science and biological control.

Objective 3.2: Build Australia's capacity to address weed problems and improve weed management   The WoNS initiative facilitates a range of training and development resources, including weed identification and management courses, monitoring workshops, and biocontrol redistribution training. WoNS supports development of networks for coordinated and community action, such as the national WoNS management groups and community weed groups. For example, the Otways Community Conservation Network, which was formed through a project developed by the National Boneseed Management Group, has evolved into an effective, landscape-scale community network linking multiple community groups to strategically manage multiple threats to the Otways region.

To address gaps in weed management, WoNS partners prioritise and communicate key weed research needs. WoNS coordinators and partners continually work to encourage weed research funding and strengthen collaboration with researchers by creating partnerships with land managers and others who can implement and inform research. Information sharing networks maintained by the WoNS coordinators are well placed to deliver the results of research and provide access to the information and tools developed

Objective 3.3: Manage weeds within consistent policy, legislative and planning frameworks   Due to

the collaborative nature of the WoNS initiative, strategic WoNS management operates within consistent frameworks. WoNS plans and activities complement and align to regional and state plans and policies. For example, the WoNS strategies are consistent with the NSW Invasive Species Plan (ISP) (DPI 2008). The NSW ISP has four goals which align closely to those of the AWS and, consequently, to WoNS Strategic Plans. These are Goal 1: Exclude - prevent the establishment of new pests; Goal 2: Eradicate or contain - eliminate, or prevent the spread of new pests; Goal 3: Effectively manage - reduce the impacts of widespread pests; and Goal 4: Capacity building - ensuring NSW has the ability and commitment to manage pests.

Weed management is a major component of Natural Resource Management (NRM) effort in Australia. The WoNS initiative works within the NRM framework to help regions deliver weed management outcomes. WoNS strategic plans assist NRM regions to set regional priorities and develop projects that are nationally strategic, increasing the effectiveness and contribution of regional activities to national targets. WoNS coordinators work with NRM regions to a) link them with current and emerging knowledge and best-practice, b) facilitate information and resource sharing and efficiency savings through development of consistent tools and resources, c) provide national support to resolution of local and regional weed issues, d) help ensure consistent, coordinated and collaborative weed control programs across all scales, and e) facilitate cross-regional collaboration and project development, increasing the opportunity for achievement of landscape scale outcomes.

CONCLUSION

The WoNS initiative strongly supports the AWS goals of preventing spread and reducing impact of weeds, as well as building capability for better weed management. WoNS strategic plans incorporate key principles and goals of the AWS, as well as state, regional and local priorities for managing the weed. These common goals and objectives increase the support for action, and clear, agreed priorities help to ensure that action is strategic and effective. As a result, weed managers from the national to local level are supporting and achieving AWS goals, as well as key state, regional and local goals.

In 2012, the Australian Weeds Committee began a review of the AWS. Lessons learned from the WoNS initiative can be used to inform AWS revisions. While WoNS is largely a single species approach, the lessons learned are common to many weeds, and increase the ability for strategic and holistic weed management.

As governments and land managers increasingly recognise the value in holistic management of biosecurity threats, future invasive species management strategies may include a focus on integrated management across the biosecurity continuum. WoNS tools and approaches address weed management challenges across the spatial continuum (pre-, border, post-border) and the management continuum (prevention through to asset protection). The WoNS initiative will continue to focus attention on weeds and promote action in a structured way to find national solutions to this national problem. Further information and all WoNS documents and tools referred to above are freely available at www.weeds.org.au/wons.

ACKNOWLEDGMENTS

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