

# Proactive EBIPM

## Establishing Weed Prevention Areas

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**W**eed prevention is the most cost-effective method of weed management. In an ecologically based management system, limiting or preventing the spread of weeds is critical to maintaining desirable plant communities. Establishing Weed Prevention Areas (WPAs) is a new and growing concept that represents a different approach to community level weed management, emphasizing added investment in prevention efforts. In this paper, we discuss the WPA concept and summarize a guide written to aid in adoption of WPAs. To illustrate the potential benefits of this way of organizing weed management efforts, we present preliminary observations of the impact of a WPA established in Utah.

### Invasive Plant Species Impacts

Invasive plant species have negative impacts on native habitats, agricultural lands, ornamental landscapes, and waterways. These impacts include loss of native plants, disruption of ecological processes, reduced habitat for livestock and wildlife, and reduced economic value. The total economic losses to the US economy due to introduced weeds are estimated at \$27 billion annually.<sup>1</sup> Invasive species significantly reduce the grazing and use of land by elk,<sup>2</sup> bison, and deer.<sup>3</sup> Medusahead (*Taeniatherum caput-medusae*) can reduce grazing capacity by up to 80% and reduce biodiversity in infested sites,<sup>4</sup> and leafy spurge (*Euphorbia esula*) infestation with 80% cover reduced livestock carrying capacity to zero.<sup>5</sup> The economic impact of leafy spurge on the livestock industry in Montana, Wyoming, and North Dakota is estimated to exceed \$129 million.<sup>5</sup> Downy brome (*Bromus tectorum*) invasion has increased wildfire frequency from once in 40 to 60 years to once in three years.<sup>5</sup> Invasive species cause increases in run-off and soil erosion,<sup>6</sup> impacting water quality in rivers and streams.

Active invasive plant management efforts are required to protect and maintain ecological integrity, function, and productivity. Once an area is invaded by noxious weeds, the ecological damage is often permanent, and these sites often do not return to the preinvasion condition.

### Ecological Principles of Weed Management

A framework and associated principles have been developed to support the adoption of Ecologically Based Invasive Plant Management (EBIPM).<sup>7</sup> This management model links processes affecting changes to the environment with associated tools and strategies to influence those processes. Ecological processes account for changes in plant communities that occur in response to invasion by undesirable plant species with the species composition of a specific site being influenced by the outcomes of succession over time. Bringing about positive changes to the site is accomplished by modifying the processes that drive succession. Major drivers include the dispersal and presence of various plant propagules on the site (species availability), the presence of open or safe sites for seeds to germinate (site availability), and the resources for plant establishment and growth (species performance).<sup>7</sup> While ecological processes can be manipulated to drive degraded ecosystems toward a more favorable state, they can also be manipulated to protect or preserve areas at a current desirable state. These measures are preventive in nature and can include actions to prevent weed invasion, including reducing disturbance, limiting weed seed dispersal,<sup>8</sup> and favoring resource capture by desirable species as opposed to invasive plants.<sup>7</sup>

### Weed Prevention and Limitations to its Implementation

Weed prevention is recognized as the most cost-effective weed management method, but is often overlooked as a management approach. Preventing the introduction and spread of invasive plants species is the basis for the federal and many state weed laws. Just like management, prevention activities require allocating resources of time and money, but returns on the initial investment are much greater with prevention compared to other management activities. Jayasuriya et al. demonstrated that the benefit-cost ratios to early management are generally very high and that even when eradication is not possible it is economical to manage invasions while at low infestation levels.<sup>9</sup>

A survey conducted with private landowners in different areas of Utah and Idaho demonstrated that although landowners feel prevention is important, several impediments

exist to implementing preventive measures, including uncertainty of the benefits, lack of readily visible results, and the implementation cost.<sup>10</sup> For landowners it is difficult to spend resources today for benefits that might or might not be realized in the future. In addition, the survey revealed that lack of knowledge was also considered an important limitation to implementing preventive measures by landowners.<sup>10</sup> Many of these impediments can be addressed through adopting a new weed management approach referred to as Weed Prevention Areas (WPAs).

### **Weed Prevention Area Concept Development**

Forming WPAs is a growing concept that represents a different approach to community-level weed management, emphasizing investment and focusing on prevention efforts. WPAs are defined as designated conservation areas cooperatively managed to prevent the spread of invasive weeds and minimize environmental and economic costs.

In large part, the WPA concept aims to change long-held ways of thinking about weeds from the traditional approach of weed management once they become an economic problem in an area to a more proactive approach that focuses on keeping noninvaded lands free from invasive plants and managing newly invading species early. For example, if the weed program's primary weed management objective is to treat as many acres as possible, then time spent spraying large tracts of degraded land best accomplishes that objective. However, if the weed management program objective is to protect as many acres as possible, then time and effort is best spent treating small invading satellite populations first and then working to contain and reduce larger weed infestations.

Although the traditional reason for creating WPAs is to protect weed-free land from invasion, as done in Montana,<sup>11</sup> in other cases the establishment of WPAs can protect somewhat degraded land from further invasion or from invasion by new species or even to prevent highly degraded land from invasion by secondary invaders. The WPA concept can be modified for different geographical scales and various numbers of participants. A WPA can be established independently as a subgroup of an existing Cooperative Weed Management Area (CWMA), or can be used to modify a CWMA to focus more on prevention.

### **Guide Development to Establishing Weed Prevention Areas to Increase Concept Adoption**

A guide, "Establishing a Weed Prevention Area, a step-by-step user's guide," was produced to provide easy-to-follow directions on how to establish WPAs in different situations.<sup>12</sup> Included are discussions of what a WPA is, and the advantages of organizing weed management efforts in this way. The guide provides detailed discussion of each step of the process and includes useful "fill-in-the-blank" forms and lists of additional resources. The major steps in forming a WPA include: 1) introducing the WPA concept, 2) organizing the

WPA, 3) developing an action plan, 4) implementing the action plan, and 5) evaluating the action plan's success. Introducing the WPA concept requires someone to champion the idea and build community support. The guide contains quick facts about weed impacts as well as a list of resources discussing weed invasions and early intervention and the consequences of weed invasion on natural resources. When organizing a WPA, information is provided about possible organizational structures to follow, as well as guidelines for prioritizing weed species and determining the weed invasion status within an area. Additionally, a survey is included for WPA participants and information sources about effective organization and group management.

Once a WPA is established, the development of an action plan is critical. Within the guide, action plan components are highlighted, including setting goals and objectives; identifying people and partners; and then determining the prevention, mapping, early detection and rapid response, and ecosystem management strategies to utilize to achieve the organization's objectives and goals. Detailed information is provided regarding prevention strategies and weed mapping and inventory approaches. The ecologically based approach to management is also highlighted and readers are led to additional information developed by the EBIPM program. Finally, ideas are presented on how to increase education and awareness regarding weed management efforts. Implementing the action plan requires carrying out the approaches determined by the group, but also includes record keeping and monitoring used to evaluate the effectiveness of the plan, as well as obtaining funding to assist in the effort.

Information is also included on potential funding sources for weed management efforts and grant writing, as well as a list of selling points for highlighting WPA efforts in grants. The final step in the process is evaluating the effectiveness of the action plan to determine if the goals and objectives of the WPA are being accomplished. If objectives are not met, then the plan is modified or changed to better meet the specified goals. A template of a WPA action plan, a project planning form, and a weed treatment form are provided in the guide to assist in organizing and tracking management efforts. It is intended that this step-by-step guide will make adopting the WPA concept easier.

### **A Case Study to Determine Impacts of Organized Weed Prevention Areas**

Although the steps to create a WPA are clear, measuring the effects of prevention efforts can be difficult,<sup>11</sup> partially because it is sometimes unclear if prevention efforts prevented a problem from occurring or if the problem would not have occurred even without those efforts. As part of a project initiated by Utah State University to evaluate the impact of WPAs, sample areas were selected and a WPA was established in one area for comparison to areas without organized WPAs.<sup>10</sup>

The South Cache Weed Prevention Area was established in northern Utah, in an area where landowners and public

agencies have worked for years to manage medusahead on range and pasture. In this instance, the development of a weed prevention area constituted a slight change in focus for a group that was already cooperating to manage a specific invasive species. The WPA development was facilitated by federal funding to hire a WPA coordinator. The objectives of this WPA are also different from others in that medusahead is already prevalent within the borders of the WPA (south end of the Cache Valley, Cache County, near Paradise, Utah), and so prevention efforts in this case are focused on containment and preventing spread of medusahead throughout the rest of Utah. Other focus species were also identified that pose invasive risk within the WPA.

The partners and entities participating or contributing to the South Cache WPA include private landowners, Cache County Weed Department, US Department of Agriculture (USDA) Natural Resources Conservation Service, Utah Department of Agriculture and Food, US Fish and Wildlife Service, Utah State University, Blacksmith Fork Conservation District, and the Utah Association of Conservation Districts. Funding for the WPA coordinator and for the development of educational material was provided by the USDA Agricultural Research Service Area-Wide EBIPM Project. This project also provided funding to conduct evaluations of the effectiveness of WPAs.

The WPA is organized with the coordinator and a steering committee comprised of local landowners, with agency and university partners providing input. The WPA leadership met two to four times per year to discuss WPA accomplishments and further directions. Funding for management activities was provided mainly from agency partners and landowners.

The activities and efforts accomplished by the South Cache WPA include coordinated mapping and spraying, newsletters, summer tours, and educational handouts provided to participants and the public. Several partners contributed to purchase a range drill for revegetation efforts after herbicide treatment. The WPA coordinator helped to find and establish research and monitoring sites and collects data after treatments were made to determine treatment effectiveness. Field tours were held annually, and winter meetings were utilized to provide education and to discuss ongoing efforts. A significant accomplishment was expanding inventory efforts to include research using remote sensing to identify the extent of the medusahead infestation. Results of these efforts show that medusahead infestations extend beyond what was previously known. Although discouraging, this knowledge expands the reach of the WPA's efforts to include a partnership with a neighboring county. The WPA management and education efforts resulted in receiving a large state grant to expand the scope of their management efforts.

Three years after establishing a WPA, the South Cache WPA has increased the number of agencies and landowners actively involved in the management of medusahead, provid-

ed additional educational opportunities for landowners and managers, and increased public awareness. Public education has led to the discovery of other areas infested with medusahead and new infestations of other invasive species (e.g., rush skeletonweed [*Chondrilla juncea*]), resulting in State funding for management and research efforts within the Cache Valley and an adjacent county.

A more formal effort to document the impact of WPAs is underway.<sup>10</sup> This effort began in 2009 and will be completed in 2012. Weed inventories conducted in 2009 will be repeated in 2012 to determine if the establishment of a WPA influenced the number or area of invasive plant infestations. Additionally, the survey sent out to landowners within different sample areas in 2009 will be repeated in 2012 with hopes of detecting changes in the perceptions and practices of landowners concerning invasive plant management in areas with and without a functioning WPA.

### **Unexpected Adoption and Adaptation of the WPA Concept**

An unexpected result of advancing the WPA concept is its acceptance and adoption by other groups and the implementation of some of the management principles to address various management situations. In these instances a WPA was not formed, but prevention principles were adapted to specific settings. For example, the concept of WPAs is popular throughout Utah when it is presented to public and private land managers as well as to homeowners and landscapers. It is interesting that the principles can be applied in an individual decision-making process or in efforts in urban neighborhoods in the same way they are applied on larger tracts of land and at larger scales.

A few County Weed Supervisors prioritized areas within their counties in relation to the presence and abundance of target weeds and are giving priority to treating those areas with limited invasive species distribution before treating those areas with much greater weed distribution. At least one government agency in Utah has expressed interest in focusing invasive species inventory efforts on more pristine areas in order to identify relatively weed-free areas for protection. By knowing the geographic location of relatively weed-free areas, specific management can focus on preventing or reducing invasion of those areas, as well as identifying potential threats to those areas.

One important concept that comes to the forefront of weed prevention is the need for weed distribution data in order to make effective weed management decisions. Weed distribution data, collected through mapping efforts, are critical in fighting weed invasions in the same way that reconnaissance information is critical to effective wildland fire-fighting.<sup>13</sup> Once a weed distribution baseline and landscape abundance are established, then the resource allocation can be made more effectively. Areas to be protected, areas already damaged, and areas for making a stand against the advancing front can all be identified.

An ecologically based approach to invasive plant management involves managing the processes of succession, including limiting the introduction and spread of invasive plant seeds through preventative measures. Weed prevention is the most economical approach to weed management, and in some cases provides the only hope for protecting certain landscapes from invasion and irreversible ecological degradation, because control and restoration programs are often extremely expensive and vary widely in effectiveness. Possible resources are likely better utilized implementing preventative measures. The adoption of WPAs is another way to focus weed management programs on prevention actions rather than solely after-the-fact treatment activities.

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