

Vegetation Management in National Parks in Arid Areas of the Pacific Northwest

By Jim Romo and William Krueger

A study to refine management of grasslands in arid land parks of the National Park Service's Pacific Northwest Region was conducted by the Department of Rangeland Resources at Oregon State University. The vegetation management plans had to comply with state and local requirements for weed control and limit the need for expensive or labor intensive vegetation management. They also needed to provide environmentally acceptable grassland management alternatives. This study aimed to define methods for suppressing weeds and perpetuating or establishing low maintenance and long-lived vegetation, in line with previously determined landscape management objectives. These objectives also included cost reduction and maintenance of diverse and aesthetically appealing vegetation.

Vegetation management was reviewed and interim vegetation management plans suggested for Fort Spokane in the Coulee Dam NRA, Spalding and East Kamiah Sites of Nez Perce NHP, Craters of the Moon NM, and San Juan Island NHP. A detailed revegetation management plan was prepared for Whitman Mission National Historic Site (NHS).

The Problems in Grassland Management

Much of the native grassland vegetation is degraded in National Parks in the arid environment of the Pacific Northwest Region. The poor ecological condition of these grasslands is primarily a product of land use prior to acquisition by the NPS and post-acquisition vegetation management that did not focus on improving vegetation conditions. Significant disturbance and changes in the composition of grasslands probably began with settlement of the area by pioneers, accompanied by uncontrolled livestock grazing and cultivation of land for crop production. After disturbances, many of these grasslands were left unmanaged; weeds invaded, and soon dominated plant communities. Grasslands later acquired by the NPS were not exempt from continued invasion by exotic weeds.

Introduction of exotic plants into arid grasslands in the Pacific Northwest has altered plant succession. Many exotic plants are weedy, representing the gamut of low to high successional roles. Several introduced species preempt native species successional, and once they establish and dominate a site, native species are very slow to reestablish. If these weeds are not controlled, natural reestablishment of native species undoubtedly will take centuries. In many areas artificial reseeding is requisite for reestablishing grassland communities that resemble pre-disturbance composition. Where native vegetation is severely depleted the natural seed source often is insufficient to insure recruitment of new plants into the populations and the probability of their widespread reestablishment is low.

Compounding the problem is mortality of established plants. Therefore, a rare sequence of years with high seed production and favorable conditions is needed for establishment of native seedlings. Because of harsh environmental conditions, competitive weeds, and few remaining native plants, reproduction of native plants is extremely slow and communities remain dominated by introduced plants.

Exotic plants may be better adapted to the sites

than native species because either they are competitively superior to native species or they occupy niches that were previously occupied by native species. Most exotic species are prolific reproducers whose seeds germinate and seedlings grow over a wider range of temperature and moisture conditions than many indigenous perennials. These characteristics allow exotic species to occupy more space and use resources, particularly soil moisture, in advance of developing perennial seedlings. Because of these characteristics natural regeneration of indigenous perennials usually is low unless exotic species are controlled. If seed production of weeds is reduced prior to seeding perennial species, and weed populations are suppressed during the first year or two after seeding, indigenous perennials usually can establish from seed. Once established, native perennials thrive and successfully outcompete exotic species.

Suppression of weeds is dependent on reducing niches and resources through maximizing growth and reproduction of desired perennial species. Controlling one weed species without establishing or encouraging the growth of desirable perennial plants usually results in replacement of the one weed with another that can tolerate the control treatment. Exotic plants have been best adapted to the disturbances in these grasslands and it is probable that if desired perennial species are not established and properly managed, weedy species will dominate in the future. Exotic plants will remain a permanent component of the flora in these grasslands and it is likely that new weeds will be introduced.

Managers have at least two alternatives: 1) control weeds as they appear in the grasslands, or; 2) limit invasion of new weeds by managing for desired plant composition while simultaneously controlling existing weeds.

Weed control can take three forms: direct control, indirect control, and the combined effects of direct and indirect control. Direct control entails implementing techniques or technology, such as herbicides, for controlling a particular weed species. Direct control alone usually is ineffective, providing short-term reductions in weed populations. With indirect control a predetermined desired vegetation is the target for management; competitive advantage is given to the desired vegetation by manipulations such as prescribed burning, mowing, or grazing. Indirect control gives the most effective long-term control of weeds. The combined effects of direct and indirect control require implementation of both strategies. Weed control in National Parks of the Pacific Northwest Region has traditionally relied on direct control, but emphasis now is being placed on direct-indirect control with indirect control of weeds being the long-term management objective.

Whitman Mission National Historic Site: A Case Study

Whitman Mission NHS (WMNHS) lies in the Palouse Prairie of southeastern Washington. After nearly 150 years of grazing, indiscriminate use of fire, cultivation of land for vegetable and grain production, and introduction of exotic plants, very little of the vegetation in the park resembles its presettlement structure and composition. Most disturbance occur-



On some sites the density of native species has been reduced by disturbance; their density will be increased by seeding and planting containerized seedlings.

red before these lands were acquired and incorporated into WMNHS. Thus, deterioration of vegetation is not recent, but is a product of past events. Although invasion of weeds may appear to be a recent phenomenon, what is actually occurring is an influx and succession to more conspicuous and better adapted exotic plants.

The most common exotic weeds at WMNHS are diffuse knapweed (*Centaurea diffusa*), yellow star-thistle (*Centaurea solstitialis*), teasel (*Dipsacus sylvestris*), poison hemlock (*Conium maculatum*), Canada thistle (*Cirsium arvense*), and cheatgrass brome (*Bromus tectorum*). Prior to settlement the native bunchgrasses, basin wildrye (*Elymus cinereus*) and bluebunch wheatgrass (*Agropyron spicatum*), probably dominated lower terraces and higher terraces and benches, respectively.

The present composition of plant communities is related to the frequency and severity of disturbance, time elapsed since disturbance, soils, topography, available sources of seeds, and past management. Before implementation of the revegetation management plan, weeds formed monocultures in some areas; in other areas nearly all the above weeds were present. In areas that supported a mix of exotic species, multiple control methods were required because of the weeds' variety of growth strategies and the ineffectiveness of a single treatment. Weed control treatments, applied alone or in combination, include prescribed fire, mechanical manipulations, grazing, and in some cases herbicides.

Within the 100 acres at WMNHS, 15 revegetation units were superimposed on the five landscape management units established in the Landscape Study and Management Alternatives for WMNHS. Delineation of revegetation management units was based on topography, soils, existing vegetation, potential native vegetation the site can support, and the ease of applying weed control and revegetation techniques.

In developing the grassland management plan for WMNHS, vegetation management was switched

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from a system of direct weed control to a plan that favors growth of desired vegetation. Initially these changes in management will require direct-indirect control methods, but eventually only indirect control of weeds will be needed.

In some places no native species exist; in others a few native plants have survived. Where native plants are absent, existing vegetation will be eliminated and native species reestablished by seeding. In areas where some native vegetation exists, the density of indigenous species will be increased by seeding and planting containerized transplants. "Magnar" basin wildrye and "Secar" bluebunch wheatgrass, improved varieties of the indigenous grasses, will be used for reseeding. Irrigation may be used to insure establishment; however, when established these species will not require inputs such as irrigation and fertilizer.

As native vegetation is reestablished in the Park, management will be implemented to perpetuate it and suppress weeds. Long term plans call for use of prescribed fire and a systematic livestock grazing system. Approximately one-third of the Park is leased and grazed under the NPS Historic Property Leasing Program, but this may be increased to approximately one-half of the area.

Weed control and revegetation efforts will be monitored. Permanent plots will be established and evaluated at regular intervals. Information derived from monitoring will be used for evaluating the effectiveness of treatments and in formulating vegetation management in other National Parks in the Pacific Northwest Region.

Summary

The grasslands in National Parks in arid environments of the Pacific Northwest Region are altered from their potential composition, structure, and function. Because these ecosystems are highly modified, they are open to invasion by many competitive and undesirable plants. Exotic plants are a permanent part of the flora of these grasslands and management must be designed to minimize their success while maximizing development of desired species. Current problems faced in vegetation management are the product of past management, necessitating that new and innovative management prescriptions be developed to perpetuate the desired vegetation.

Effective management of these grasslands requires adjustments in vegetation management philosophy. Grasslands must be managed to minimize dilemmas rather than to treat vegetation problems as they develop. Cause-effect relationships must be scrutinized and management designed to treat the causes of problems rather than the effects. Management cannot stop with control of weeds and reestablishment of desired perennial vegetation; it must be sustained to perpetuate desired vegetation.

Romo was a research associate and Krueger is Department Head of Rangelands Resources at Oregon State University. Romo is now an assistant professor of Plant Ecology and Range Management at the University of Saskatchewan, Canada.