Ecological Restoration and Habitat Renewal of the South Okanagan Shrub-Steppe

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ABSTRACT

An ecosystem recovery project is beginning in a 50-ha shrub-steppe site in the South Okanagan, British Columbia. The project has 2 objectives: (1) to restore the community structure, function, and species composition of the natural habitat; and (2) to develop effective and economical restoration techniques for degraded natural systems.

Key words: bunchgrass, ecosystem restoration, hayseeding, shrub-steppe, South Okanagan, weed control.

The South Okanagan is a biodiversity hot spot (Mosquin et al. 1995) and the shrub-steppe communities of this area are an integral part of the ecosystem. However, fragmentation and livestock grazing have degraded the native shrub-steppe plant communities and the consequences of past land use are reduced diversity and cover of native plant species, increased bare ground, and invasion by nonindigenous species. An ecosystem recovery plan is being prepared for the area and ecosystem restoration and habitat renewal are priorities for such planning (T. Slater, Canadian Wildlife Service, pers. comm.). Until now the required research on habitat restoration has not occurred. This project addresses this lack of restoration knowledge.

The Osoyoos Desert Society acquired 50 ha of shrub-steppe and began a 5-year program for ecological restoration and habitat renewal of the site in 1998. The project area is in the Southern Okanogan Basin Ecosection and the Okanagan very dry hot Bunchgrass (BGxh1) biogeoclimatic subzone and variant. Two provincially Red-listed shrub-steppe plant communities, antelope-brush–needle-and-thread grass (*Purshia tridentata–Stipa comata)* and great basin sage–bluebunch wheatgrass (*Artemisia tridentata–Elymus spicata*), occur on the project site. The listed communities are habitat for >100 rare plants, 300 rare invertebrates, 29 Red- and Blue-listed vertebrate species, and 4 species of management concern for the South Okanagan Conservation Strategy (Scudder 1994, 1996; Bryan 1996; Conservation Data Centre 1997).

OBJECTIVES AND METHODS

The ecological restoration and habitat renewal project has 2 objectives: (1) to restore the community structure, function, and species composition of the natural habitats, and (2) to develop effective and economical restoration techniques for degraded natural systems. Four project goals will guide the restoration techniques for the site: (1) reduce the weedy species component, (2) increase the cover and recruitment rate of native grasses and forbs, (3) replace areas of early successional species with climax species, and (4) maximize species diversity within each of the identified habitat types.

Restoration techniques follow 2 approaches: rigorous scientific experiments and general habitat enhancement. Both passive and active restoration methods will be tested. Experiments focus on alternative weed control measures, efficiency of restocking strategies, and effectiveness of soil amendments. Additional habitat enhancement activities that will increase community structure and plant diversity will occur in areas of the site that are not used for experimental plots.

YEAR 1: 1998–1999

Objective 1: To restore the community structure, function, and species composition of the natural habitats.

1. Collecting and cleaning native seed from 4 perennial bunchgrasses, 4 shrubs, and 1 forb.
   - Approximately 40% of the native seed required for future experiments was collected during the 1998 field season. The resources required to obtain the native seed were staggering. Extensive stands of native bunchgrasses are

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exceedingly rare in the South Okanagan and access to them is difficult. Most of the remaining natural areas are on private land or are protected and many landowners and land managers are reluctant to allow native seed harvesting. In addition to a poor supply, few seed collectors are trained, and seed cleaning techniques are rudimentary. The time required to pick and clean the native seed varied by species, but producing 1 kg of pure seed (pick and clean) ranged from 6 person-hours for sand dropseed (*Sporobulus cryptobulus*) to 57 person-hours for bluebunch wheatgrass.

2. Enhancing habitat by controlling weeds, hayseeding[1], building habitat structures, and designating walking trails.
   - 3,075 kg of noxious weeds were hand-pulled, bagged, and removed from areas around the experimental plots. The targeted species were diffuse knapweed (*Centaurea diffusa*), dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*), hound's tongue (*Cynoglossum officinale*), and mullein (*Verbascum thapsus*).
   - Following weed removal, bare soils were covered with native hayseed.
   - Old roads and trails were deactivated. The roads and trails were blocked with piles of brush. These piles provide cover and roosting sites for wildlife.

Highly competitive weed species are colonizing the disturbed soils on the site. Weed colonization uses limited resources and prevents the establishment of native species (Ross and Lembi 1999). We are reducing soil disturbance on the site by designating walking trails; however, by removing weeds and supplying a native seed source we are also encouraging the establishment of native species. In addition to seed, native hayseeding material supplies organic matter, which helps rebuild soil structure and bolster nutrient cycling. The habitat structures also contribute to seeding of disturbed areas because reptiles, small mammals, and birds are valuable seed dispersers in the shrub-steppe system and they will use more of a site if shelter, nesting, and roosting areas are readily available.

Objective 2: To develop effective and economical restoration techniques for degraded natural systems.

1. The delineation, staking, and tagging of 305 100-m^2 experimental plots (60 plots each at 5 experiment replicates at the same study site, plus 5 plots selected solely to assess the effect of control of dalmation toadflax).
2. Collection of vegetation data from 3 1-m^2 quadrats randomly located within each 100-m^2 plot (n = 915). Percent cover, distribution and vigour of the vascular plant species, and percent cover of moss, lichen, litter, and bare ground were collected from each quadrat. Soil texture data were collected from the 305 100-m^2 plots.
   - Soil texture differed over the site. Textures in replications (Reps) 1–4 were similar, but Rep 5 soils contained more sand and less silt (Fig. 1). On average, Rep 5 also contained a higher cover of litter, bare ground, weeds, and native herbs, but fewer native grasses than Reps 1–4 (Figs. 2, 3). There was no difference in the average amount of nonvascular plant cover between areas (Fig. 4).
3. The initiation of 1 active experiment (hayseeding perennial bunchgrasses) and 4 passive restoration experiments (alternative manual weed control techniques for diffuse knapweed and dalmatian toadflax and an assessment of plant community response without restoration).
   - Stalks of native grasses were applied to the experimental plots as seed ripened. Bluebunch wheatgrass (*Elymus spicata*) was applied first, followed by needle-and-thread grass (*Stipa comata*), sand dropseed (*Sporobolus cryptandrus*), and red three-awn (*Aristida longiseta*).

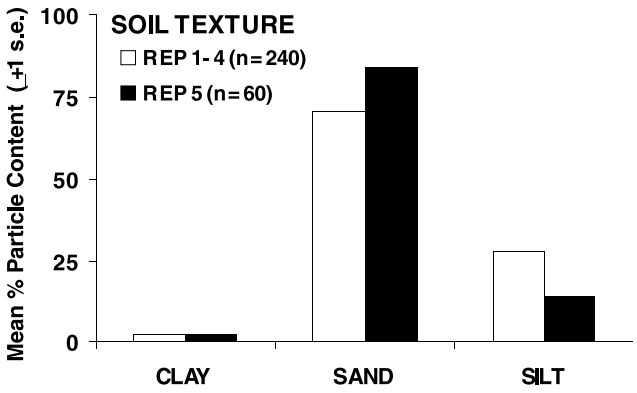

Figure 1. Average percent of clay, sand, and silt particles in Reps 1–4 soils and Rep 5 soils (mean ± 1 SE).

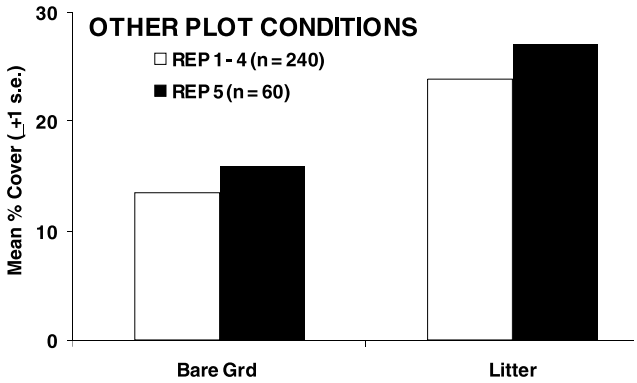

Figure 2. Average percent cover of litter and bare ground in Reps 1–4 and Rep 5 (mean ± 1 SE).

[1] Hayseeding is the mowing or cutting of plant stalks with mature seed heads from similar vegetation communities and scattering them over the planting site (Cottam 1987).

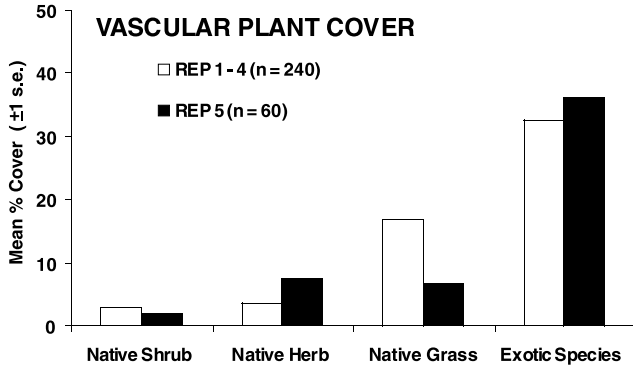

Figure 3. Average percent cover of native shrubs, herbs, grasses, and exotic (weed) species in Reps 1–4 and Rep 5 (mean ± 1 SE).

Scientific research is required to develop effective and economical techniques for ecological restoration of British Columbia's dryland habitats. In the 1998 field season, we set up the experimental plots and collected the baseline data. After data collection, 5 of the planned restoration experiments were initiated. Dr. G. G. E. Scudder (University of British Columbia) is monitoring the use of the native habitats by invertebrates. His monitoring program will determine if habitat use changes in response to the restoration treatments.

Activities Planned for 1999–2000

The 1999–2000 activities include the initiation of 2 passive and 2 active restoration experiments; monitoring and data collection for the restoration experiments initiated in 1998; continued habitat enhancement of areas surrounding the experimental plots; monitoring and possible retreatment of habitat enhancement activities completed in 1998, and carrying out preliminary activities for experiments planned for the 2000–2001 season.

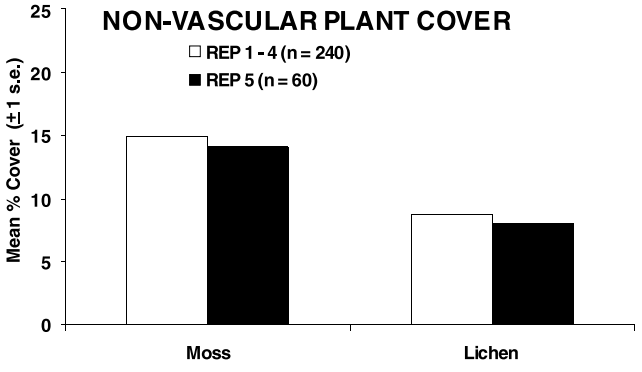

Figure 4. Average percent cover of nonvascular plants (mosses and lichens) in Reps 1–4 and Rep 5 (mean ± 1 SE).

DISCUSSION

The primary value of the restoration project is the conservation and enhancement of endangered habitat and the subsequent benefit to wildlife dependent on the natural systems. In addition, experiments are the beginning of a 5-year demonstration project on ecological restoration and habitat renewal in degraded natural systems. Results from the experiments will enable scientists and land managers to determine ecological protocols for protected areas and habitat remnants. The experimental treatments will also be a central part of the interpretative program of the Osoyoos Desert Society and will educate and involve the public in habitat preservation and renewal techniques.

The experimental results are years away, but the need for native seed has already been identified. We must develop a native seed industry that can supply British Columbia seed for British Columbia habitats. Research on seed transfer limits for native grasses and forbs, appropriate seed mixes, and efficient seed handling techniques are required—again, results would be years away. As an immediate remedy, land managers considering ecological restoration should develop native seed increaser fields. The current rate of land conversion is threatening the future supply of native seed.

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