Restoration and Reclamation Review
Student On-Line Journal
Vol.7, No.2, Fall 2001
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# Overview of Vol.7, No.2 - Grasslands, Meadows, Desert Scrub

## Long-term Efforts to Restore Grasslands

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Each long-term restoration paper reviewed in this section exemplifies how human colonization plays a large role in the loss of species and in the destruction of land (Hobbs and Norton 1996). Through development, over grazing, oil drilling, and fire suppression, for example, ecosystems are altered and unstable states are typically maintained for years until efforts are made to restore these systems back to their original, or near original states. The difficulty in restoring these systems is that all too often restoration projects are limited in scope or duration. A portion of restoration success depends on several key components such as: 1) identifying stressors across all scales, that lead a system to degradation, 2) developing realistic goals and identifying ecological and socioeconomic limitations, 3) developing methods and techniques to reverse degradation and achieve goals, 4) developing observable measures of success, and 5) documenting and communicating methods and results. Another portion of restoration success depends on soil restoration. Physical hostility, deficiencies of resources, and inhibition to plant growth by toxins are a few common limitations that negate succession in restored systems (Bradshaw 1997).

While all other components are important, the real challenge in long-term restoration projects comes from developing successful methods and techniques to reverse degradation and soil restoration. Because plant species depend on the soils ability to provide energy and nutrients, it is logical that every restoration project should begin by restoring soil quality. Development of both residential and industrial areas and grazing can cause soil compaction. Soil compaction is a serious problem as it reduces soil pore space thereby impeding the plants ability to uptake water and nutrients. Irwin noted difficulties in establishing native plant species as a result of compaction due to residential development. Both Kettenring and McDonough noted compaction problems following grazing and farming. Farming, for example, changed the distribution of soil size classes, which caused a loss of water aggregates and decreased the soils ability to support vegetation.

Ways to alleviate soil compaction are ripping, scarification, and imprinting. Mason found that ripping the soil improved water infiltration. In addition to these techniques, exclosures have been used to alleviate compaction from grazing. Kettenring reports a loss of Cryptogamic crusts after grazing by livestock. Cryptogamic crusts are a soil community consisting of moss, lichens, fungi, green algae, and cyanobacteria that are crucial to cool desert systems, as they are beneficial in soil stabilization, water absorption, and soil fertility. Kettenring noted areas with exclosures had more lichen and moss coverage and density.

There are many other mechanisms involved in restoring ecosystems in addition to soil quality. Site preparation, for example, is important in grassland restorations. McDonough notes disking as one site preparation method. Disking removes weeds, reduces light competition, and allows for good soil contact and is recommended to occur several times before planting. Preparation methods noted by Irwin include razing surface areas of abandoned sites, removing topsoil, contouring, removing buried concrete, herbiciding, and burning. Burning is an important tool in grassland site preparation (and maintenance). Noser notes that fire historically occurred in grassland areas in Custer State Park. Burning in these areas helps reduce accumulated litter, provide dark ash substrates, and reduce the woody species component. McDonough also notes the use of fire in Prairie systems in Illinois. Fire in these systems helps reduce non-native species by providing suitable substrates for competitive native prairie species.

Planting is another mechanism used in restoration. Planting can help facilitate and boost succession at a faster rate than what would naturally occur. Peterson discusses the importance of re-vegetation of gravel pads in Alaska. Planting fast growing native species, for example, reduces thermokarst reactions in gravel pad areas. When planting is not used as a mechanism for restoration, areas usually contain undesirable non-native species that prevent establishment of desirable native species by competing for nutrients, light, and water.

Choosing the right species to plant via historical records or remnant sites is important, but as important is the method and timing of planting. Schramm (1990) discusses two planting strategies: 1) single seeding/planting and 2) multiple stage seeding/planting over several years. McDonough describes planting strategies at Fermilab in Illinois as being multi-staged. First, there is an initial planting of a 'prairie matrix' that helps to eliminate weeds, provides fuel loads, and prepares site for less competitive species. The second stage consists of inter-seeding, followed by a third stage of planting competition sensitive species after early successional species have become established. The most appropriate time for seed dispersal is in spring.

Developing seed mix, acquiring seeds and plants, seeding techniques, and maintenance are additional components that are important for restoring grassland systems. Site preparation and planting were described at length in this review because they were the common components throughout all grassland papers. They are also the components that have changed and improved through long-term restoration efforts. Long-term restorations are necessary as some systems like deserts and tundra, and perhaps even temperate grasslands, likely take centuries to recover.

**References**

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