Importance of Shrub Restoration on Great Basin Rangelands

Charlie D. Clements, Mark Freese, Mike Scott, Jeff White and Dan Harmon

[1] Rangeland Scientist, Great Basin Rangelands Research Unit, US Department of Agriculture, Agricultural Research Service, 920 Valley Road Reno, NV 89512

charlie.clements@ars.usda.gov

[2,3] Habitat Supervisory Biologist and Supervisory Wildlife Biologist, Nevada Department of Wildlife,

[4] Vice President, Elko Land and Livestock,

[5] Agricultural Research Science Technician, Agricultural Research Service

Introduction

Brush/browse species were often overlooked as a component of rangeland production in the early years of range management. Initially, herbaceous species were considered the basic component of rangeland forage. Arthur Sampson, one of the founders of scientific range management, was among the first to describe and discuss native range shrubs as components of the basic forage supply on ranges in 1924. By 1931, USDA, Forest Service Ecologist William A. Dayton published *Important Western Browse Plants*. Dayton researched range forage for the USDA, Forest Service when the agency published the *Range Plant Handbook* in 1937. Among the contributors to this publication was Odell Julander, a noted mule deer researcher, who stressed the importance of antelope bitterbrush as a critical shrub on winter ranges for deer, elk and antelope. As he noted, antelope bitterbrush is palatable during all seasons and preferred by all classes of domestic large animals, except horses.

By the 1940s, a growing concern on the effects of domestic livestock use of range plants led to a livestock/wildlife conflict. In 1945, Utah State researchers L. A. Stoddart and D. I. Rasmussen with the publication *Deer Management and Livestock* expressed a view that deer and domestic livestock could co-exist on the same rangelands. The debate however lives on as many grazing permit renewals are challenged in court directly due to possible impacts to wildlife species such as sage grouse, mule deer, pygmy rabbits, and an array of other species.

Figure 1. The loss of critical browse species from wildfire can lead to an empty plate scenario which can be devastating to wildlife, especially wintering mule deer herds.

Cheatgrass Invasion

The accidental introduction, subsequent establishment, and invasion of cheatgrass on rangelands resulted in an increase in the chance, rate, spread, and season of wildfires. This in turn has increased wildfire frequencies from an estimated 60-110 years down to as little as every 5-10 years, simply too short of a time period to allow for the recovery of critical shrub species (Figure 1).

We present two shrub species, antelope bitterbrush and big sagebrush and methods by which to restore these critical shrub species in Great Basin plant communities.

Figure 2. The successful seeding of antelope bitterbrush and long-lived perennial grasses to suppress cheatgrass, while providing excellent browse and cover for wildlife.

Antelope bitterbrush seed productions starts to decrease after 60-70 years of age, which significantly influences its' ability to recruit and sustain populations. In southern Oregon, researchers reported that an antelope bitterbrush population of 473 bitterbrush plants/acre only needed the successful recruitment of 6.7 bitterbrush seedlings/year to sustain the population, yet only 0.7/year were establishing. This makes management intervention critical in decadent stands where many factors can inhibit recruitment. We have recorded as much as 52% insect damage on seeds and 85% seed consumption by granivorous rodents. This along with decreased productivity leads to a need for restoration.

Restoration Methods

We have conducted research on direct seeding as well as transplanting of antelope bitterbrush. Transplanting antelope bitterbrush is the most common method used by resource managers as volunteer planting labor is seemingly cost effective. However we have observed transplant survival as low as 0% and as high as 27%, with fall transplanting experiencing higher success than spring. We have demonstrated excellent success and recruitment of antelope bitterbrush with direct seeding methods. With an average of 16,800 bitterbrush seeds/pound, at a 2-3 lb/acre rate using a rangeland drill, we established between 700 to 1,800 plants/acre (Figure 2). The high level of success experienced with direct seeding was achieved at less than $100/ac, while this same level of success using transplants would be thousands of dollars per acre.

Big sagebrush produces over 7,000 seeds/shrub (more than 2.2 million seeds/pound), and germinates at a wide range of soil temperatures suggesting that this shrub species would not have difficulty recruiting and sustaining populations.. The problem however, is the simple fact that big sagebrush does not survive wildfire, and with the ever-increasing wildfire occurrences and the magnitude of acres affected by these wildfires, vast landscapes that once were big sagebrush/bunchgrass communities are now dominated by annual grasses. Land managers have the difficult task of restoring big sagebrush to these plant communities. Even though most seeding efforts include Wyoming big sagebrush broadcasted at a 0.10 to 0.25 lbs/arce rate, very few success stories exist.

Seed Banks

Seed banks are a means by which a species can persist after disturbance such as fire. Our research efforts found that Wyoming big sagebrush did not build seed banks, therefore is highly dependent on active management to restore this species back to its' former habitats. We did however observe a seed bank with mountain big sagebrush which has the ability to return after a fire. The presence or absence of a seed bank can dramatically effect restoration methods used by land managers.

Restoration Methods

Aerial seeding should be conducted on snow-free habitats to ensure the embryotic root has soil contact. Big sagebrush can be direct seeded by placing the seed in the forb box of the rangeland drill, removing drop tubes from furrow discs, and allowing the seed to fall to the surface of the soil. Using a a culti-packer wheel to press the seed to the surface also improves establishment (Figure 3). Transplanting of Wyoming big sagebrush is becoming more common as seeding establishment is difficult. We have found that transplanting in the late Fall is most successful in the northwestern Great Basin as opposed to spring transplanting (Figure 4).

Figure 3. A successful seeding of Wyoming big sagebrush by dropping the seed on the ground directly and using a tire culti-packer to firmly press the seed into the soil surface.

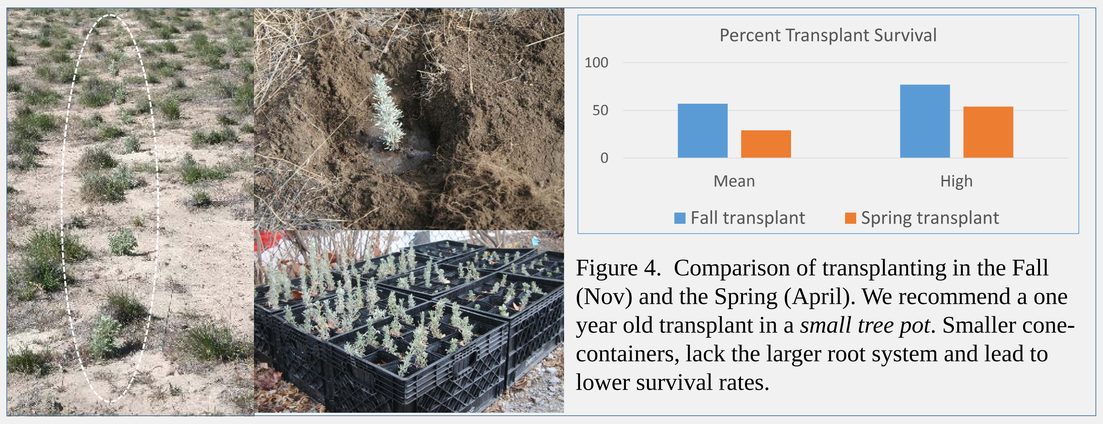

Figure 4. Comparison of transplanting in the Fall (Nov) and the Spring (April). We recommend a one year old transplant in a *small tree pot*. Smaller cone-containers, lack the larger root system and lead to lower survival rates.