To Seed or Not to Seed: Effects of Seeding Native vs. Non-native Grasses on Plant Communities in Recently Burned Sagebrush Steppe

INTROUCTION

In many semi-arid shrublands of western North America, especially the Great Basin, postfire landscapes are routinely seeded to suppress the growth and reproduction of non-native invasive plants that my otherwise cause significant ecological harm. A classic example of this type of negative ecological effect is the way that cheatgrass (*Bromus tectorum*) can alter fuelbed characteristics and fire regimes, and convert native sagebrush steppe into non-native annual grassland. Specific information is needed regarding the types and amounts of seed that are most effective in suppressing invasive plants, preventing the ecological impacts they may otherwise cause, and promoting the dominance of native plant communities.

Non-native perennial grasses such as crested wheatgrass (*Agropyron* spp.) have been traditionally used to seed postfire landscapes in the sagebrush biome. Perennial grasses generally do not promote fire to the degree that annual grasses like cheatgrass do, which is a key aspect of post-fire restoration in shrubland ecosystems. Non-native perennial grasses are thought to establish more readily and grow faster than native species. These qualities of non-native perennial grasses are believed to confer greater competitive influence over invasive plants such as cheatgrass. Unfortunately, these assumptions are based on very little scientific evidence. More information is needed to make appropriate decisions about the design of postfire seeding projects.

Cannon Fire Study Site. Dominant vegetation is Poa bulbosa, a non-native, cespitose perennial grass. Photo Bridget Lair

Major Points:

- Effects of native vs. non-native seeding treatments may not become evident until mature plants become established.
- Soil disturbance created by the seeding process had undesirable effects on plant communities during the first few post-treatment years.
- Total plant cover was lower in seeded than non-seeded areas during the first post-treatment year.
- Dominance of the non-native bulbous bluegrass and cheatgrass were highest seeded treatments.
- Dominance of native annual forb cover was also highest in seeded treatments.
- In contrast, dominance of native perennial species cover, seed density, and richness were greatest where seeding did not occur.

In this study we evaluated the effects of seed mixes comprised of native vs. non-native perennial grass species during the first two post-treatment years. Response variables included density and cover of non-native and native species, and overall plant community diversity.

STUDY DESIGN

The study site is within the perimeter of the Cannon Fire (22,750 acres, June 2002) near Walker, CA. Prefire, dominant vegetation included mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), perennial grasses (*Poa bulbosa, Elymus elymoides*) and various forbs. After burning, the invasive alien perennial grass bulbous bluegrass (*Poa bulbosa*) dominated the site along with small amounts of cheatgrass.

Seeding treatments were applied in November 2002. The native seed mix included equal pure live seed proportions of bluebunch wheatgrass (*Pseudoregneria spicata*), bottlebrush squirreltail (*Elymus elymoides*), and Indian ricegrass

(*Achnatherum hymenoides*). The non-native seed mix included equal proportions of hycrest crested wheatgrass (*Agropyron cristatum*), Siberian wildrye (*Agropyron fragile*), and Russian wildrye (*Psathyrostachys juncea*). The two seeding treatments each resulted in 30 live seeds/ft^2. A rangeland drill was used to cover seed with soil and to create furrows to accumulate rainfall.

Rangeland drill created furrows and covered seeded species

RESULTS AND CONCLUSIONS

The ecological effects of seeding native vs. non-native perennial grasses were not readily apparent during the first two post-treatment years at this study site due to the low establishment rates of seeded species. During the first post-treatment year (2002), cover of native seeded species was 1.8% and of alien seeded species was 1.1%. During 2003, cover of native seeded species remained 1.8% and cover of alien seeded species increased to 2.7%. Low establishment rates may have been partly due to below average rainfall prior to the first post-treatment summer, and only average rainfall during the winter prior to the second post-treatment summer.

During subsequent years, after the seeded species have grown to maturity and begin to reproduce, the differential effects of the two seed mixes on plant community composition may become more evident. We plan to resample these experimental study plots in the future.

Seeding, regardless of the seed mix, effected plant community composition more than any other variable tested during the first two post-treatment years. Apparently, the act of turning the soil with the rangeland drill was the causative factor. Seeding compared to unseeded controls reduced total cover 15% and native cover 50% in the first post-treatment year. By the second year, native species cover increased slightly, but remained less than the control. Non-native cover increased ~10% from the control in 2003, and continued to increase to 20% greater cover than the control in 2004.

Seeding increased density, cover, and species richness of native forbs, but also increased seed density and cover of the non-natives bulbous bluegrass and cheatgrass and decreased cover and species richness of native perennials. Seed density of native perennial grasses was greatest where no seeding occurred, whereas seed density of alien annual grasses, alien perennial grasses, and native forbs was greatest in seeded plots. Bulbous bluegrass benefitted greatly from seeding.

The particularly strong positive effect of seeding on bulbous bluegrass likely resulted from disturbance from the rangeland drill. Turning the soil likely divided and dispersed perennating root tissue, increasing the density and cover of this species.

Land managers generally consider bulbous bluegrass less of a threat than cheatgrass or medusahead (T*aeniatherum caput-medusa*) to the economic and ecological integrity of rangelands (Personal communication Roger Rosentreter, Botanist Idaho BLM). However, bulbous bluegrass possesses high reproductive capacity and unusually diverse genetic variability for a clonal perennial grass (Steve Novak, Boise State University). The combination of these two traits indicates that this species has great potential as an invasive weed in the intermountain west. Documents indicate that bulbous bluegrass has been in the intermountain west at least since al least the 1920's, and it's range includes all of the western United States.

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