





Effectiveness of Sagebrush Steppe Post-fire Rehabilitation Projects: Short & Long-term Responses

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Effective?





Do seeding projects meet their objectives?

 Erosion or Invasives control?

 Do seeding projects establish perennials, especially sagebrush better than no seeding?

Two Approaches



- Literature & BLM Monitoring Reports
- Assigned each treatment a success rating based on the narrative
- Two observers agree on ratings



- Chronosequence of fire rehab projects
- Measured cover & density on projects 8 to 20 years posttreatment
- Sagebrush, perennial grass, & exotic annuals

Literature Synthesis

- Literature
 - Quaility rating Used Controls; peer-reviewed
 - Must have fire before treatment
- Monitoring Reports
 - Some lacked narrative or data to judge level of success
 - Some information on success was contradictory
 - Data trumped narative
 - Ratings based on implementation types
 - Aerial & Drill separately
 - Test of independence using G-test
 - Logistic Regressions for environmental data

Rating Criteria

- Good widespread establishment of most seeded species
- Fair establishment mixed among spp. or patchy establishment
- Poor little establishment or only some establishment of a minority of spp.
- Fail Little or no establishment

- "Fully successful", "good", "excellent", "fantastic"
- "Partially", "somewhat", "marginal success", "fair", "patchy"
- "poor", "low density", "limited", "minimal", "sparse"
- "Not successful", "failure", "no establishment from seeding"

Literature - Soil Erosion

- Most research in forests with aerial seeding (Peppin et al. 2010; Robichaud et al. 2000)
 - Short-term mostly ineffective
- Drill seeding (1 study)
 - Increased water/soil erosion short-term
- Monitoring reports
 - Assume establishment reduces erosion
- Wind erosion & seeding
 - Lack studies

Milford Flat Fire and seeding

Photo: M. Miller, USGS



Photo: S. Popovich, BLM Shoshone F.O.

Literature - Invasive Plants



- 18 peer reviewed studies
- Broadcast & Drill were NS different
- Monitoring rarely measured

	Invasive 1	Neutral	Invasive 🗸
Broadcast	1	7	2
Drill	1	4	3

Locations of 328 BLM ESR Seedings 3rd Yr. Monitoring Reports



Drill (114) Aerial (214)



Environmental Effects on Seeding Success



- Precipitation -PRISM
- Elevation DEM
- Logistic Regression of Success (Good & Fair) vs Failed (Poor & Failure)
 - Related to elevation and growing season precipitation

Drill Success = a + Elevation

Probability Of 0.8 Success @ 0.6 12 in Avg Ppt 0.4 0.2



Aerial Success = a + Elev + Precip

Probability 8.0 Of Success 0.6 @ 12 in Ppt Yr1 ^{0.4} 0.2 0.0



Fire Rehab Chronosequence



- Burned
 - Seeded/Unseeded
- Unburned
 - Unseeded
- Matched Ecol. Sites
- 3 reps / project
- Across 7 MLRAs
- Over 60 projects

Density of Wyoming Sage



Density of Sage by Age of Seeding



Project Age



Deep-rooted Perennial Grass Cover vs Age Burned and Seeded Plots Only



Cheatgrass Cover Versus Age Burned and Seeded Plots Only



Conclusions

- Do seeding projects effectively control erosion?
 - Few studies
 - Probably not in the short-term, may in long-term
- Do seeding projects effectively control invasive plants?
 - Literature inconclusive
 - Chrono Project Seeding 1 deep-rooted perennial grasses & 1 cheatgrass
- Sagebrush has established poorly in fire rehab projects
 - Need to examine seeding techniques

Many Thanks!

Joint Fire Science Program



 Dave Repass & BLM's ESR state & FO coordinators

• USGS & USFS