Effectiveness of post-fire aerial seedings in the Northeastern Mojave Desert

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Post-fire aerial seeding study #1

Short-term Establishment of Aerial Seeding Treatments in Blackbrush and Pinyon-Juniper sites 3 Years Following the 2005 Southern Nevada Complex (Brooks, Klinger, and Matchett, in preparation)

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S NV Fire Complex Aerial Seeding Treatments

Vegetation types	Origins	Lifeforms	Rates (PLS/acre)	Acres
mesic blackbrush	Natives and non-natives	Perennial grasses/shrubs and forbs	12	10,000
wilderness PJ	Natives	Perennial grasses and forbs	5	10,800
non-wilderness PJ	Natives and non-natives	Perennial grasses and forbs	6	26,200

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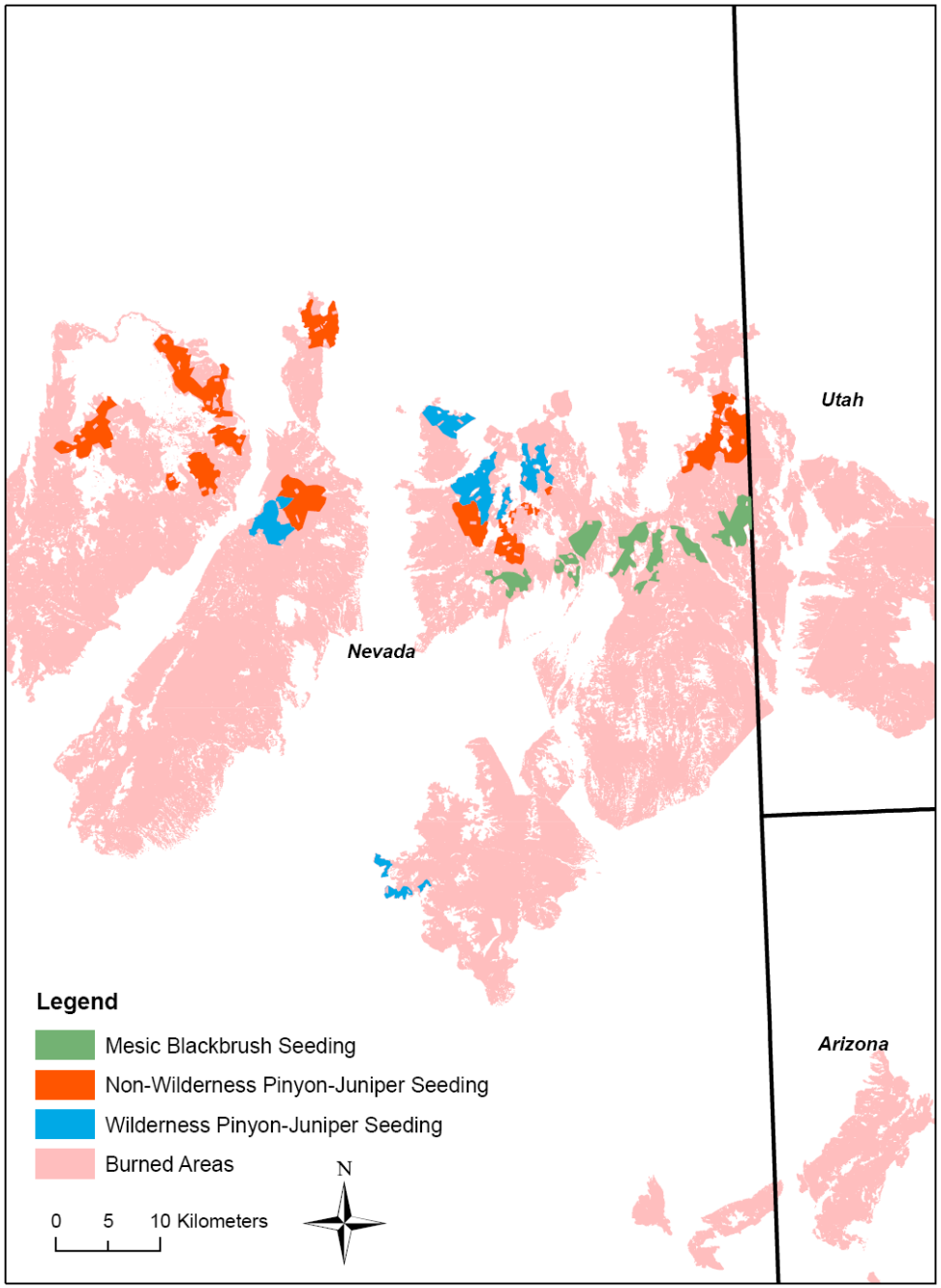
Table 1. Seed mix species composition.

Seed Mix	Species scientific name	Species common name
Mesic Blackbrush	*Achnatherum hymenoides*	Indian ricegrass
	Kochia prostrata (non-native)	forage kochia
	Atriplex canescens	fourwing saltbush
	Elymus elymoides	bottlebrush squirreltail
	Pleuraphis jamesii	James galleta
	Linum lewisii (non-native)	Lewis blue flax
	Grayia spinosa	spiny hopsage
	Sporobolus cryptandrus	sand dropseed
	Sanguisorba minor (non-native)	small burnet
	Poa secunda	Sandbergs bluegrass
Non-Wilderness Pinyon-Juniper	*Achnatherum hymenoides*	Indian ricegrass
	Elymus lanceolatus ssp. lanceolatus	thickspike wheatgrass
	Elymus wawawaiensis (non-native)	Secar Snake River wheatgrass
	Elymus elymoides	bottlebrush squirreltail
	Poa secunda	Sandbergs bluegrass
	Agropyron fragile (non-native)	Vavilov Siberia wheatgrass
	Agropyron cristatum (non-native)	crested wheatgrass
	Penstemon palmeri	Palmers penstemon
Wilderness Pinyon-Juniper	*Achnatherum hymenoides*	Indian ricegrass
	Elymus elymoides	bottlebrush squirreltail
	Hesperostipa comata	needle and thread
	Poa secunda	Sandbergs bluegrass
	Penstemon palmeri	Palmers penstemon


Utah
Nevada
Arizona
Legend
Mesic Blackbrush Seeding
Non-Wilderness Pinyon-Juniper Seeding
Wilderness Pinyon-Juniper Seeding
Burned Areas
N
0 5 10 Kilometers

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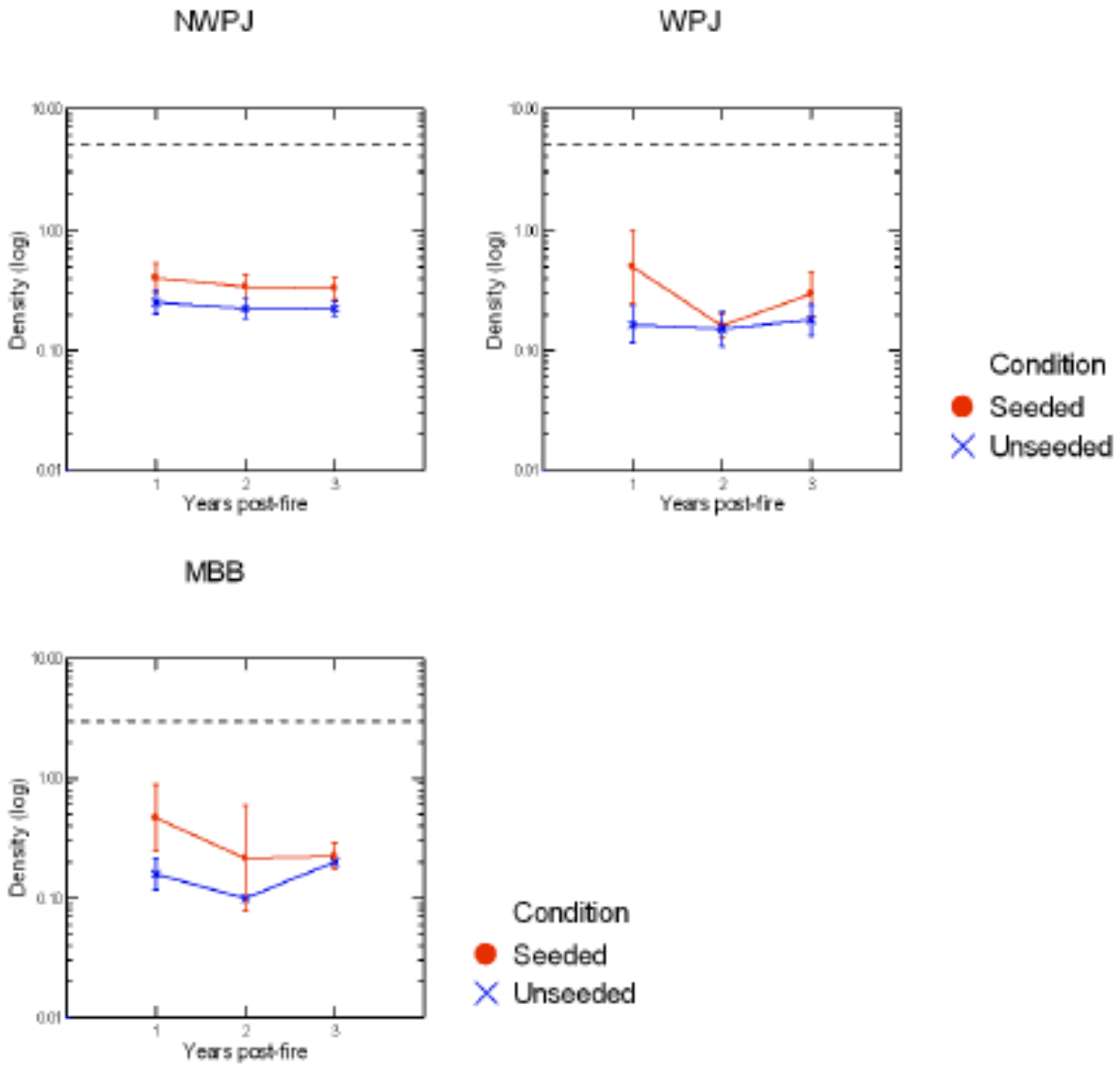
NWPJ
WPJ
MBB
Density (log)
Years post-fire
Condition
Seeded
Unseeded

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S NV Complex Aerial Seeding Treatments Summary

- We observed marginally significant establishment rates of seeded species during the first 3 postfire years.
- However, their absolute densities were far below the objectives stated in the seeding plans, and at levels that may be ecologically insignificant.
- Although the long-term effects of the seedings may not yet be realized, the prevalence of non-native annuals across the burned areas and their negative correlations with establishment rates of perennial plant seedling reported in an earlier talk on short-term fire effects suggests that additional recruitment of seeded species past the initial sampling period of 3 years may be negligible.
- Periodic monitoring of the sampling plots subsequent years was recommended.

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Post-fire aerial seeding study #2

Establishment of Plants from Postfire Aerial Seeding Treatments Implemented 1993 to 2007 in the Eastern Mojave Desert (Brooks and Klinger, in preparation)

Vegetation conditions were documented during spring 2009, 2-16 years after implementation, within 0.1 hectare plots.

74 plots in seeded areas and 170 plots in unseeded areas, matched for time since fire and elevation

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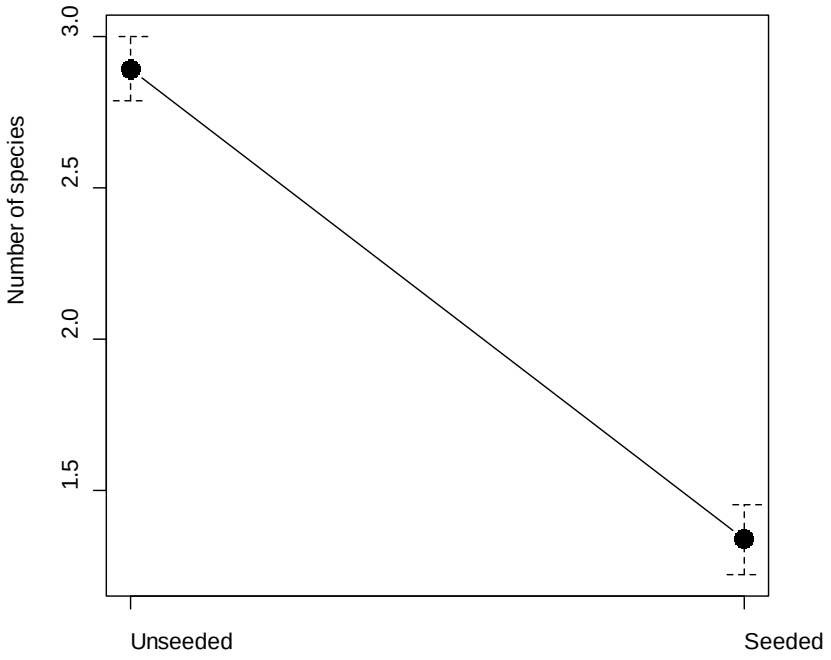
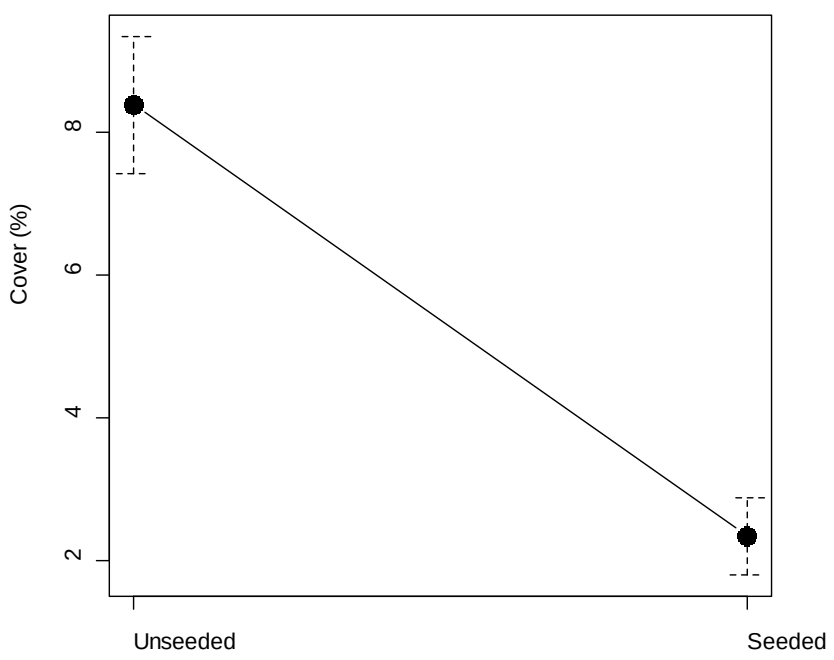
Table 4. The 35 species and species varieties represented by the 9 seeding projects that were analyzed.

Species
Achnatherum hymenoides (Roemer & J.A. Schultes) Barkworth
Achnatherum hymenoides (Roemer & J.A. Schultes) Barkworth - Nezpar
Achnatherum hymenoides (Roemer & J.A. Schultes) Barkworth - Rimrock
Agropyron cristatum (L.) Gaertn. - Ephraim
Agropyron desertorum (Fisch. ex Link) J.A. Schultes x Agropyron cristatum (L.) Gaertn. - CD-II PVP
Agropyron desertorum (Fisch. ex Link) J.A. Schultes x Agropyron cristatum (L.) Gaertn. - Hycrest
Agropyron fragile (Roth) Candargy - Vavilov
Agropyron fragile (Roth) P. Candargy
Atriplex canescens (Pursh) Nutt.
Bassia prostrata (L.) A.J. Scott
Bromus inermis Leyss. ssp. inermis
Elymus elymoides (Raf.) Swezey
Elymus lanceolatus (Scribn. & J.G. Sm.) Gould
Elymus lanceolatus ssp. Lanceolatus (Scribn. & J.G. Sm.)Gould - Bannock
Elymus lanceolatus ssp. Lanceolatus (Scribn. & J.G. Sm.)Gould - Critana
Elymus multisetus (J.G. Sm.) M.E. Jones - Sand Hollow Germplasm
Elymus trachycaulus (Link) Gould ex Shinners
Elymus trachycaulus (Link) Gould ex Shinners ssp. trachycaulus
Elymus wawawaiensis J. Carlson & Barkworth - Secar
Hesperostipa comata (Trin. & Rupr.) Barkworth
Krascheninnikovia lanata (Pursh) A.D.J. Meeuse & Smit
Linum lewisii Pursh
Linum perenne L. - Appar
Melilotus officinalis (L.) Lam.
Onobrychis viciifolia Scop. - Eski
Pascopyrum smithii (Rydb.) A. Löve
Penstemon palmeri Gray
Pleuraphis jamesii Torr. - Viva
Poa secunda J. Presl.
Poa secunda J. Presl. - Canbar Canby
Pseudoroegneria spicata (Pursh) A. Löve
Purshia tridentata (Pursh) DC.
Sanguisorba minor Scop. - Delar
Sporobolus cryptandrus (Torr.) Gray -
Thinopyrum intermedium (Host) Barkworth & D.R. Dewey - Luna

Post-fire aerial seeding study #2

The number of seeded species and the cover of seeded species were both higher in unseeded than seeded areas.





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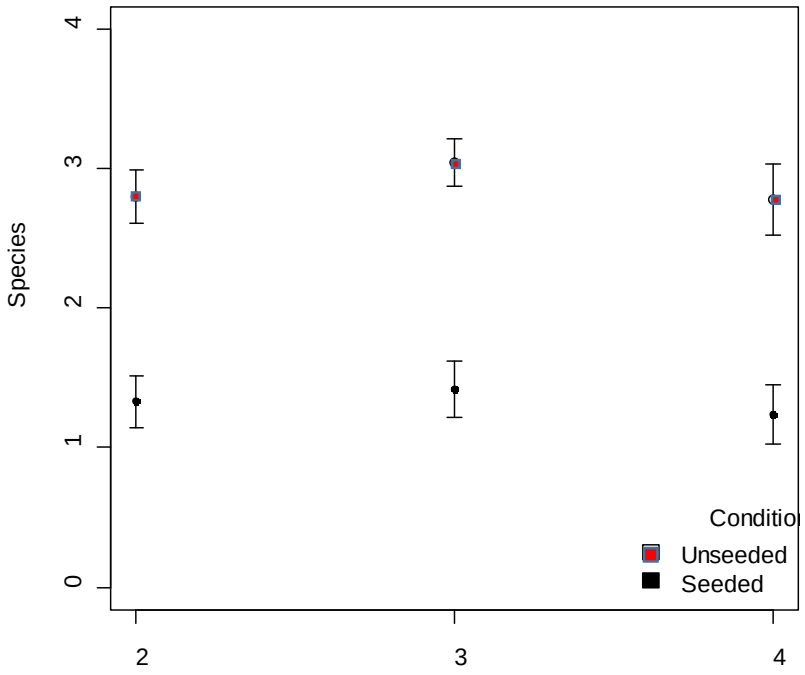
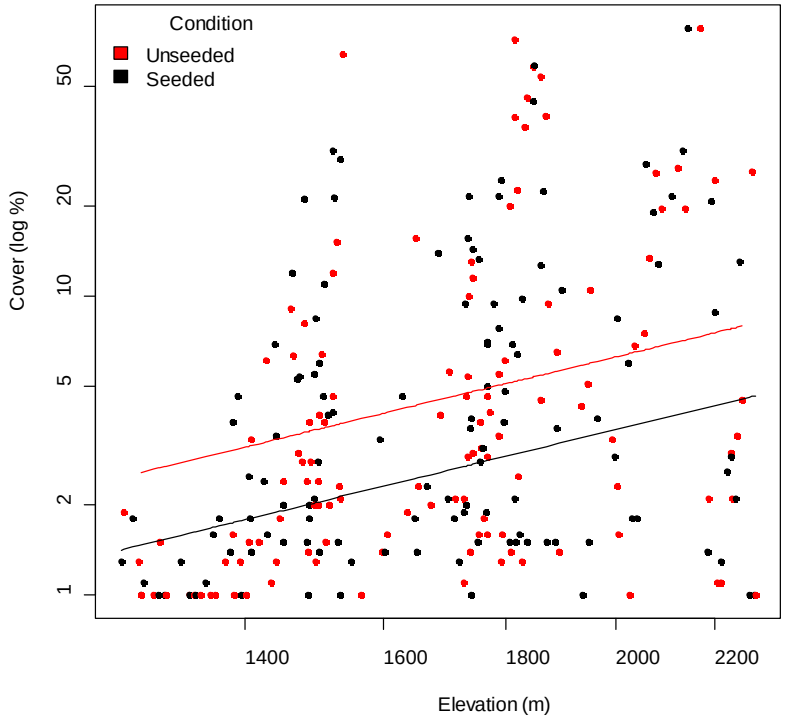
Potential biases due to seeded plots being in areas of systematically different severity, fire frequency, time since last fire, and elevation were ruled out.





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Post-fire aerial seeding study #2

It is possible that land use regimes before and/or after the seeding treatments may have differed between unseeded and seeded areas and influenced the results.

Although this study suggests that postfire aerial seedings may not be effective in the Mojave Desert, it should not be construed as evidence against other forms of seeding that involve soil amendments and/or specific efforts to work seeds into the soil.

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Post-fire aerial seeding study #3

Long-term effects of seeding after wildfire on vegetation in Great Basin shrubland ecosystems (Knudson in press)

Examined vegetation at 88 sites where aerial or drill seedings were implemented following fires between 1990 and 2003 in Great Basin shrublands. Compared matched burned-seeded, burned-unseeded, and unburned-unseeded areas.

- Seeding non-native perennial grasses and the shrub *Bassia prostrata* resulted in more vegetative cover in aerial and drill seedings, with non-native perennial grass cover increasing with annual precipitation.
- Post-fire seeding of native perennial grasses generally did not increase cover relative to burned-unseeded areas, except after drill seeding when competitive non-natives were not included in mixes.
- Seeding native shrubs, particularly *Artemisia tridentata*, did not increase shrub cover or density in burned areas.
- Cover of undesirable, non-native annual grasses was lower in drill seedings relative to unseeded areas, but only at higher elevations.

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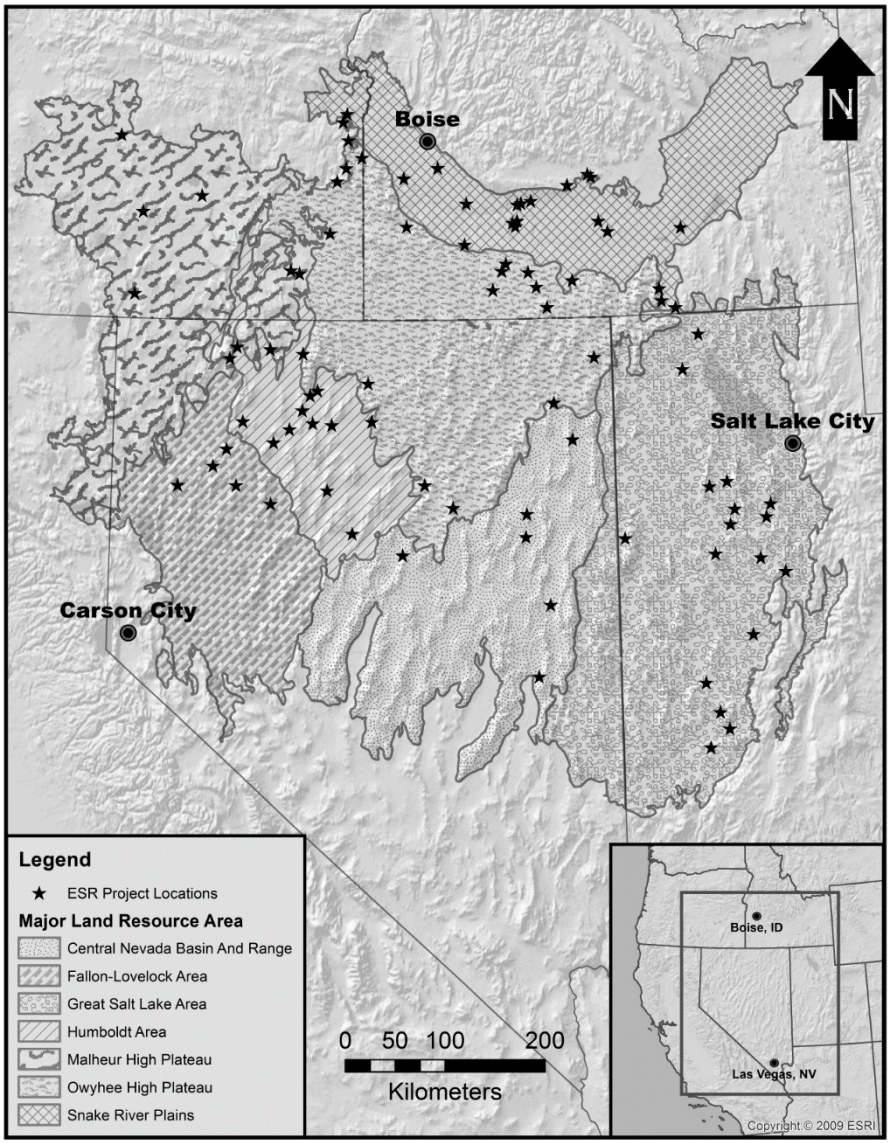
Post-fire aerial seeding study #3



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Post-fire aerial seeding study #3

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Synthesis and applications

- Seeding after wildfire is generally ineffective at drought-prone, low elevation sites.
- On lower and drier sites where potential for invasion and impacts of non-native annuals is high, management objectives are unlikely to be met with seeding alone, and intensive restoration methods such as invasive plant control prior to seeding may be required.

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