Native Forbs and Restoration Technology for the Great Basin

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Boise RMRS Research Species

Penstemon - Beardtongue

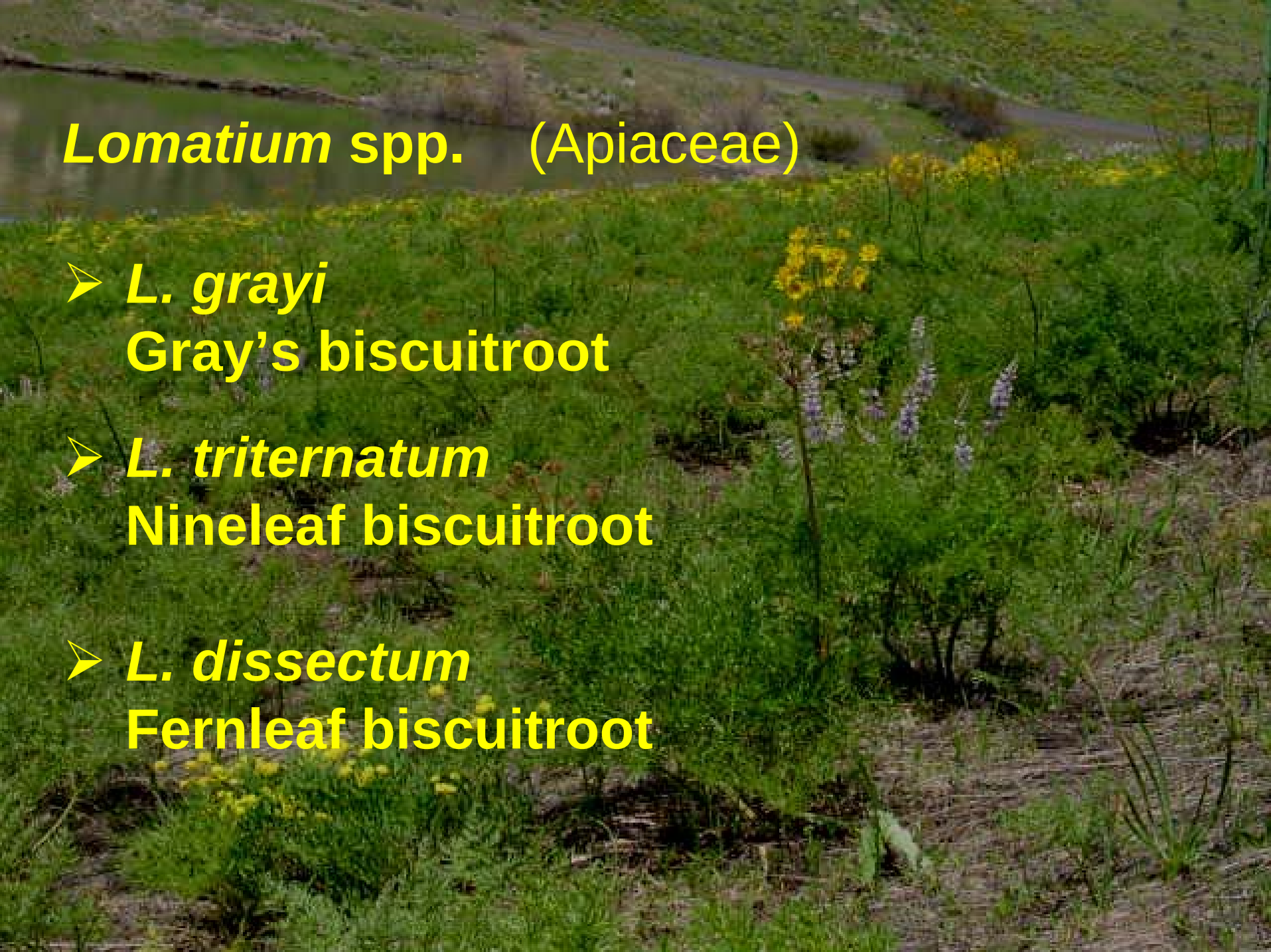
- *P. acuminatus* – sand penstemon
- *P. deustus* – scabland penstemon
- *P. speciosus* – sagebrush penstemon

Eriogonum – Buckwheat

- *E. umbellatum* – sulfur-flower buckwheat

Lomatium - Biscuitroot

- *L. grayi* - Gray's biscuitroot
- *L. triternatum* – nineleaf biscuitroot
- *L. dissectum* - fernleaf biscuitroot



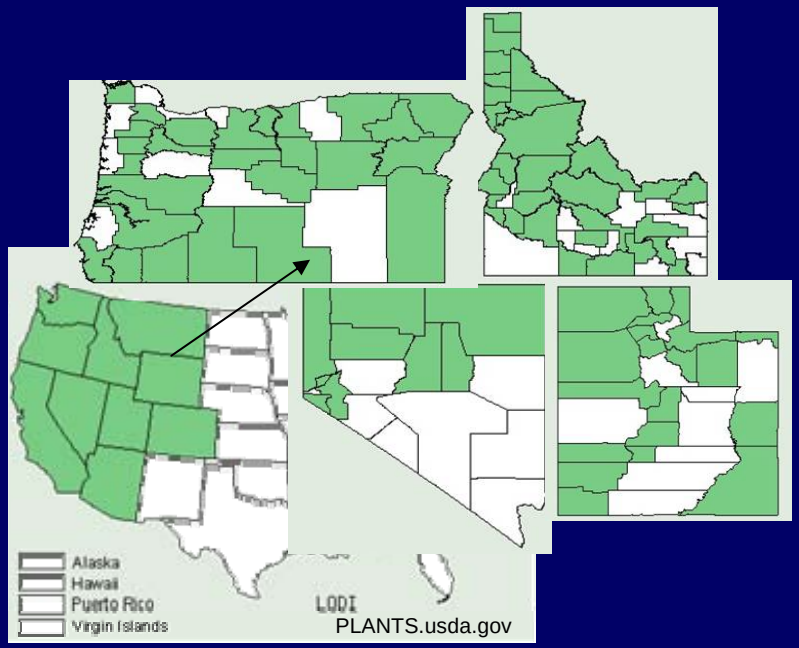
Lomatium spp. (Apiaceae)

- ***L. grayi***
  Gray's biscuitroot
- ***L. triternatum***
  Nineleaf biscuitroot
- ***L. dissectum***
  Fernleaf biscuitroot

Lomatiums: Seed Production Potential

- Upright species
- Seed production by year 2 or 3
- Seed ripens uniformly, fairly large
- Easily harvested and cleaned
- Good yield, stores well
- Pollinators - solitary bees

Lomatium dissectum Fernleaf biscuitroot

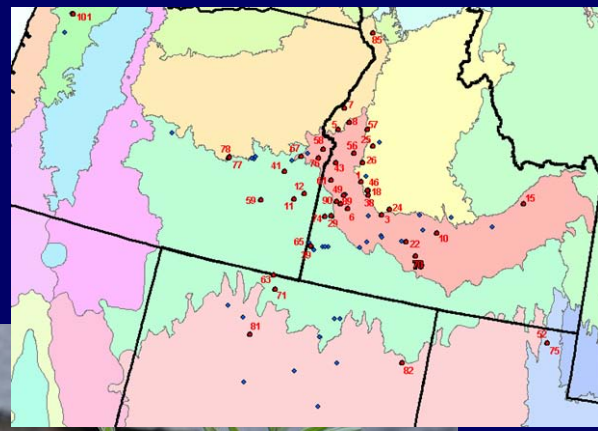


- Large perennial (to 5 ft) with large, thickened woody taproot
- Widespread on variable medium- to coarse-textured soils
- Grows at elevations from 60-2,600 m
- Early phenology, dries back in late spring - early summer
- Used by wildlife, sage-grouse, livestock

Fernleaf Biscuitroot: Collections, Common Gardens, Genetics

Objective:

- Examine variation across the Great Basin
- 100+ collection sites
- Common gardens (2006):
  - Wells, NV (44 accessions)
  - Boise, ID (46 accessions)
  - Corvallis, OR (12 accessions)
- Genetics:
  Collaborative with USDA-ARS
  Pullman, WA



Fernleaf Biscuitroot: Dormancy, Germination and Field Establishment

M. Scholten, M. Serpe (BSU), N. Shaw

Objectives:

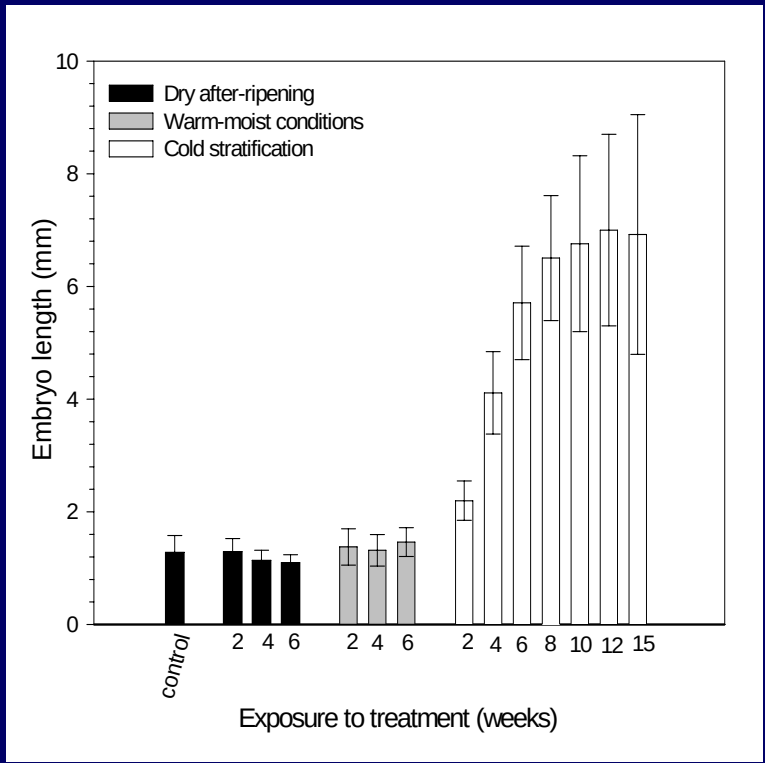
1. Characterize the nature of seed dormancy.

2. Identify conditions required for dormancy release and germination.

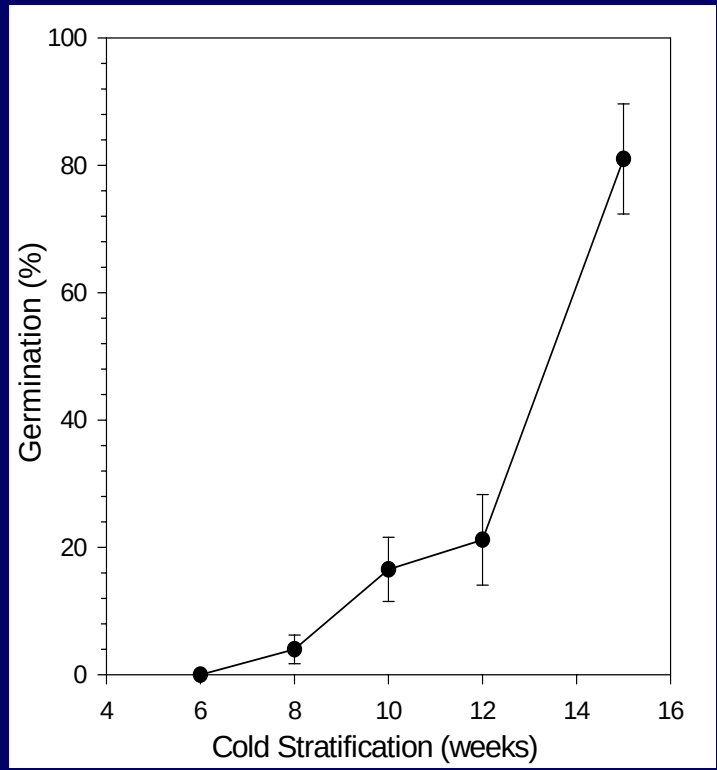
3. Determine the effect of environmental conditions on embryo growth and dormancy break.

Fernleaf Biscuitroot: Dormancy and Germination

Induction of Embryo Growth

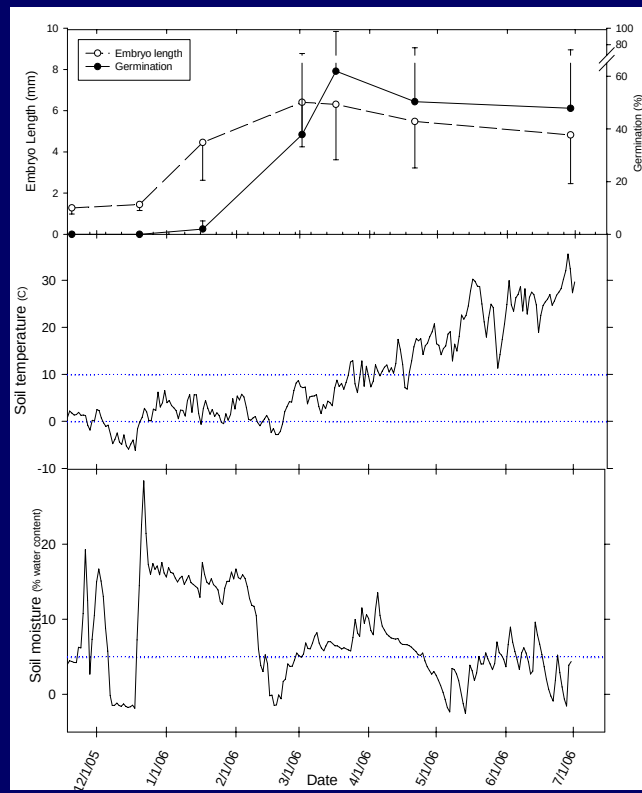


Prechill Requirement for Germination



Fernleaf Biscuitroot: Field Germination and Future Research

- Embryo growth and germination promoted by soil temperatures between 0 and 10°C.
- Physiological basis for dormancy break.
- Results will aid seed growers in achieving more uniform stands



Seed Collections and Plant Materials

Great Basin Seed Collections:

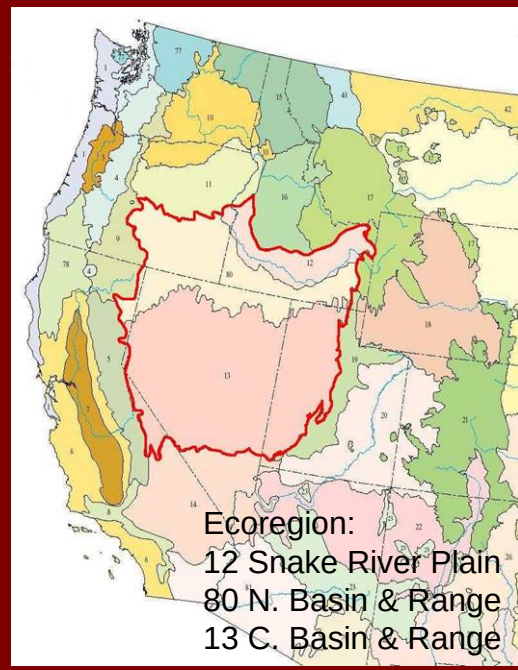
1,460 for RMRS and UDWR (since 2001)

2006 Seed Collections (Boise)

167 Total
52 National Seed Laboratory
40 ARS Pullman
8 PNW – Corvallis, OR

Seed to growers included pooled sources for:

Lomatium dissectum	N. Basin & Range
P. speciosus	N. Basin & Range
Penstemon attenuatus	Snake River Plain
P. deustus	Snake River Plain



Thurber's Needlegrass
Achnatherum thurberianum

Source:
Orchard, Ada Co., ID

Proposed release category:
Selected

Area of use:
Lower Snake River Plain and adjacent areas

Characteristics:
Persistent once established

Other sources:
None

Sandberg Bluegrass (*Poa secunda)*

Source: Mountain Home, ID

Proposed release category: Selected

Characteristics: Early green up, good establishment

Area of use: Lower Snake River Plain and adjacent areas

Other sources:

- Reliable, Yakima WA (ARS Logan)
- High Plains, WY (Bridger PMC)
- ARS Pullman – collecting westwide

Western Yarrow
Achillea millefolium

Source:
Eagle, ID

Proposed release category:
Selected

Characteristics:
Good establishment in ARTR

Area of use:
Foothills in southern Idaho and adjacent areas

Other sources:
- Great Northern, Flathead Co., MT (Bridger PMC)
- Yakima, WA (ARS Logan)

Crested Wheatgrass Diversification

Examine

CWG control (mechanical and chemical)

Establishment of native species within the stand

Questions

Species interactions:

- **among seeded natives**
- **seeded natives and cheatgrass**
- **seeded natives and CWG**

Competitive Dynamics Among Siberian Wheatgrass and Native Forbs and Grasses

Jennifer Muscha, M. Haferkamp, N. Shaw, and L. Vermeire
USDA-ARS Fort Keogh LARRL, Miles City, MT & USDA-FS RMRS, Boise, ID

Objective

Examine interactions of native seed mixtures with Siberian wheatgrass.

Species

Exotic grass

AGSI	Siberian Wheatgrass

Native grasses

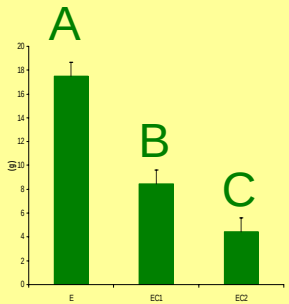
ELEL	Squirreltail
POSE	Sandberg bluegrass

Native forbs

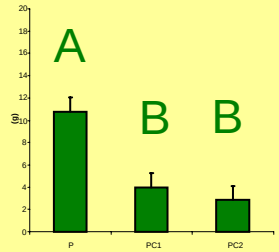
ACMI	Western yarrow
PESP	Sagebrush penstemon

Treatments:

C1 - AGSI (1 plant)
C2 - AGSI (2 plants)
E - ELEL, ACMI, PESP
P - POSE (2), ACMI, PESP
EC1 – E with 1 AGSI
EC2 – E with 2 AGSI
PC1 - P with 1 AGSI
PC2 - P with 2 AGSI

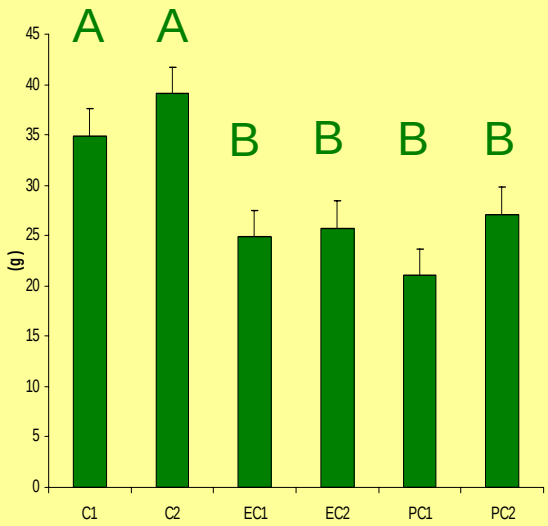


Bottlebrush squirreltail biomass

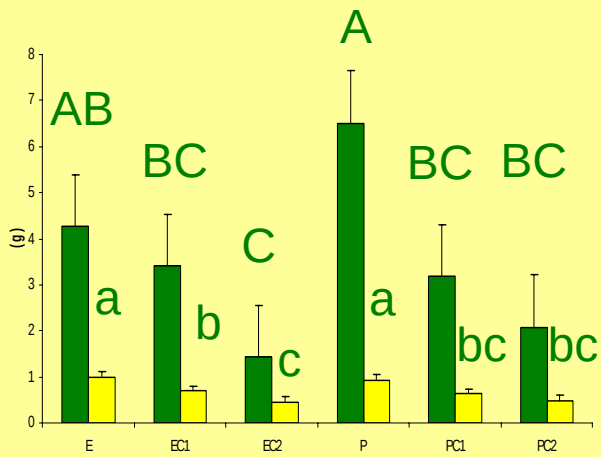


Sandburg bluegrass biomass

Results:



Siberian wheatgrass biomass



ACMI

PESP

Forb biomass

Conclusions

- ELEL growth > POSE
- ACMI develops more rapidly than PESP, begins developing rhizomes in < 5 mo.
- Although competitive effects appear reciprocal, AGSI control prior to seeding natives is essential.

Competition Among Cheatgrass and Native Forbs and Grasses

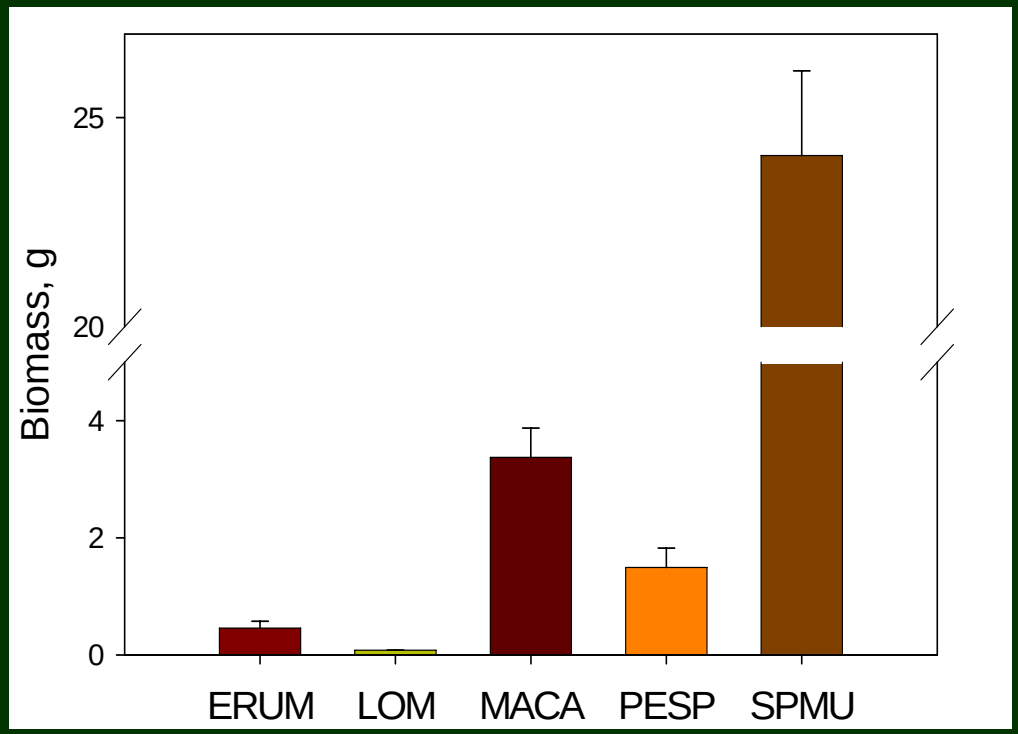
H. Parkinson & C. Zabinski, Montana State University, N. Shaw

Greenhouse study objectives:

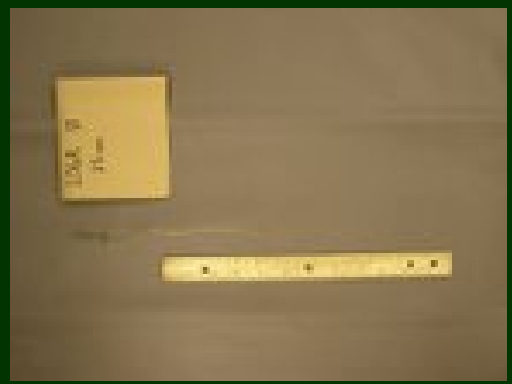
1. Compare relative growth rates of:
   - ERUM Sulfur flower buckwheat
   - LOM Biscuitroot
   - MACA Hoary aster
   - PESP Sagebrush penstemon
   - SPMU Munro globemallow

2. Determine changes in forb growth when grown with:
   - ELEL Bottlebrush squirreltail
   - POSE Sandberg bluegrass
   - BRTE Cheatgrass

Forb Biomass After 12 Weeks

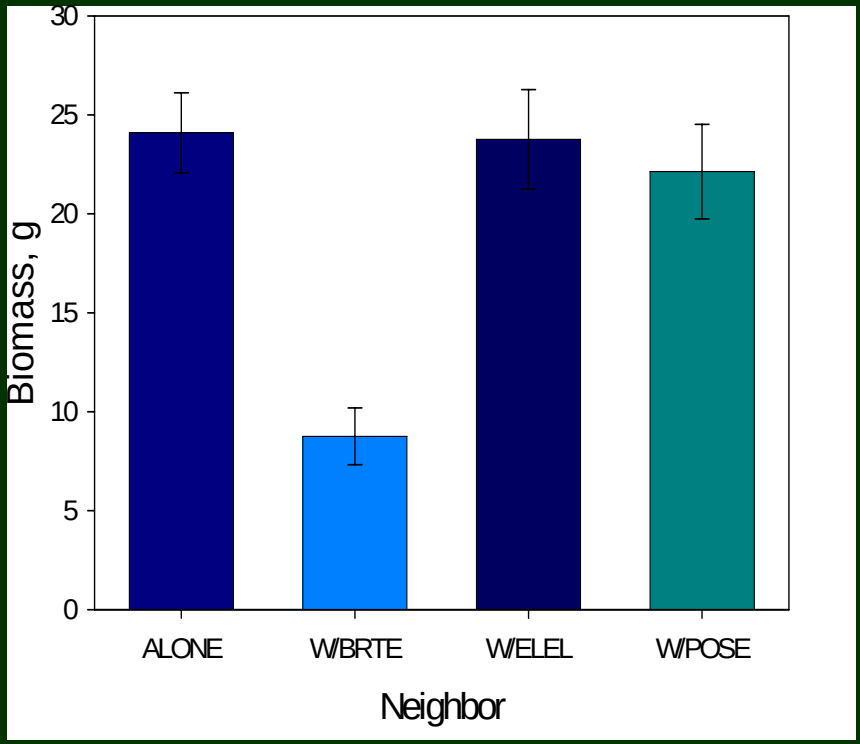


Hoary aster



Gray's Biscuitroot

Munro Globemallow *Growth* with Neighbors (12 weeks)



Grown with Sandberg bluegrass (l)

Grown with cheatgrass

Competitive Effects of Cheatgrass on Selected Great Basin Forbs

Objectives:

1. Measure growth of 5 native forbs when growing with cheatgrass planted at 5 different densities.
2. Examine variation in soil water depletion by forb species and cheatgrass.

Forb Species

- Western yarrow
- Sulfur-flower buckwheat
- Gray's Biscuitroot
- Sagebrush penstemon
- Munroe globemallow

Cheatgrass densities:

- 0, 45, 90, 180 and 360 plants/m^2

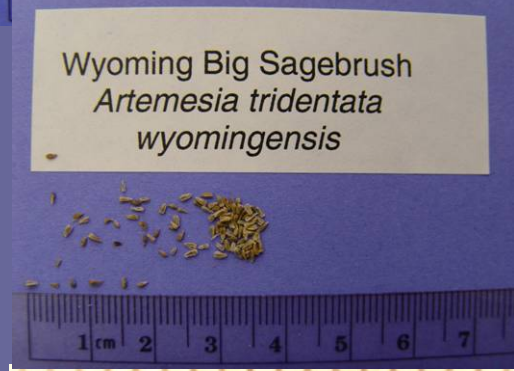
Reestablishing Diverse Native Communities

Mixtures desirable to:

- Conserve/reestablish diversity
- Restore ecosystem structure and function
- Resist invasives

Challenges

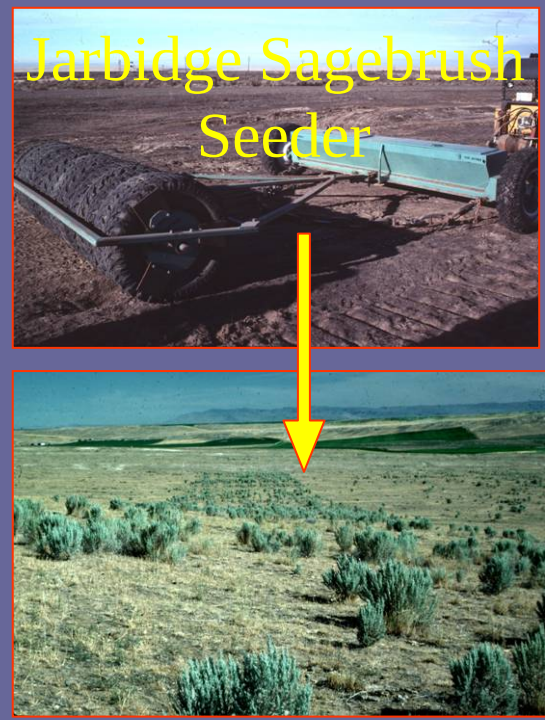
- Seeds shapes and sizes
- Seeding depths and rates
- Seedbed requirements
- Equipment needs and modifications
- Species interactions
- Seeding sagebrush



Pale agoseris, *Agoseris glauca*

Landscape Scale Sagebrush Seedings

- Lack of success with aerial seeding on Wyoming big sagebrush sites
- Lysne and Pellant (2004): 23 of 35 southern Idaho Wyoming big sagebrush seedings failed
- Seeding success has been obtained by pressing the seed into the soil surface



Reestablishing Diverse Wyoming Big Sagebrush Communities: Equipment and Techniques

R. Cox, N. Shaw, NRCS, BLM

1. Examine the ability two drills (Kemmerer and Truax) to establish species mixes.
2. Compare establishment at two seeding rates.
3. Examine the use of brillion packers to plant sagebrush and other small-seeded species.
4. Compare establishment of weedy species in areas seeded with each drill.

Study Sites

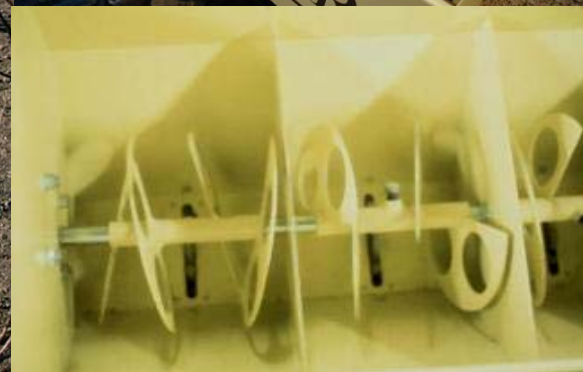
Two 2006 burns near Elko, NV

Treatments

Control (no drilling or seeding)

Kemmerer drill (no seed, low rate, high rate)

Truax drill (no seed, low rate, high rate)



Seed Mix

Drill mix

- Fourwing saltbush
- Blue flax
- Munro globemallow
- Bluebunch wheatgrass
- Bottlebrush squirreltail
- Indian ricegrass

Broadcast

- Wyoming big sagebrush
- Rubber rabbitbrush
- Western yarrow
- Sandberg bluegrass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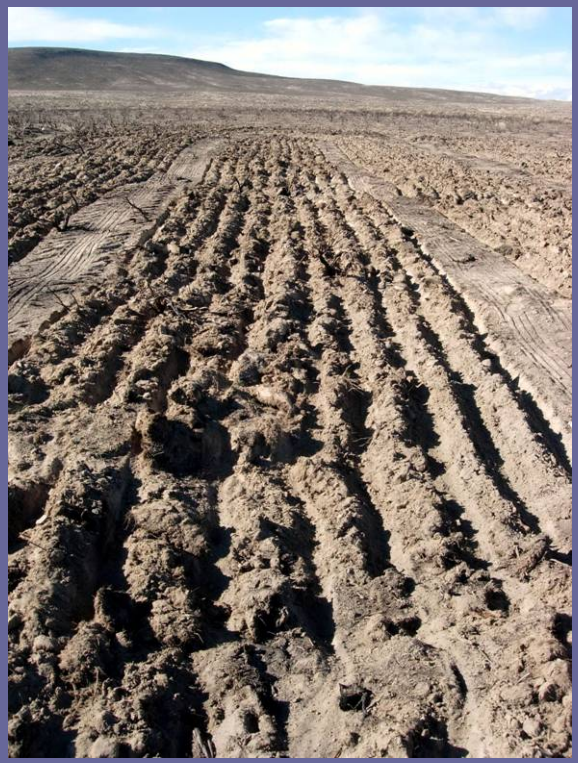
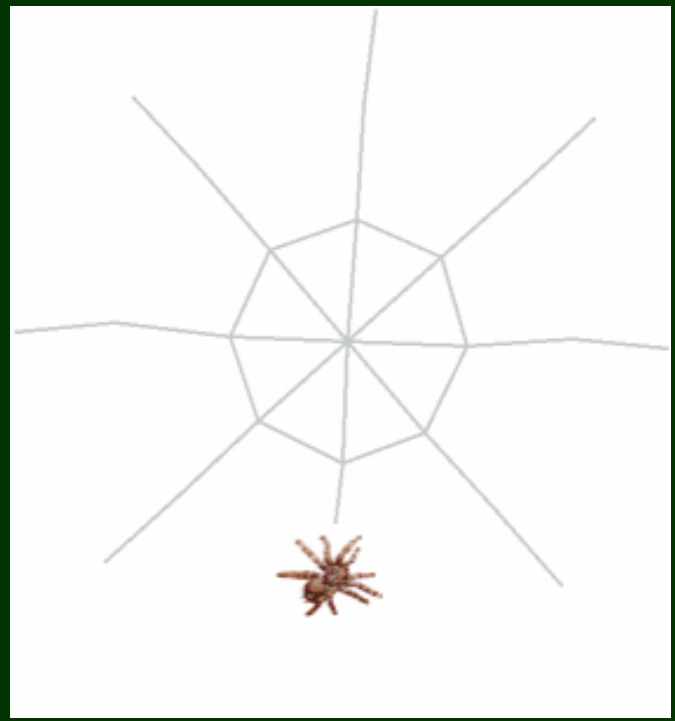


Great Basin Native Plant Selection and Increase Project website

http://www.fs.fed.us/rm/boise/research

- Cooperators
- Links
- Results
- Literature



Acknowledgments

- USDI Bureau of Land Management, Great Basin Restoration Initiative and Great Basin States
- Great Basin Native Plant Selection and Increase Project Cooperators
- Grassland, Shrubland and Desert Ecosystems Program employees, Boise, ID and Provo, UT