

A Collaborative Program to Provide Native Plant Materials and Restoration Strategies for the Great Basin

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Federal Interagency Native Plant Materials Development Program

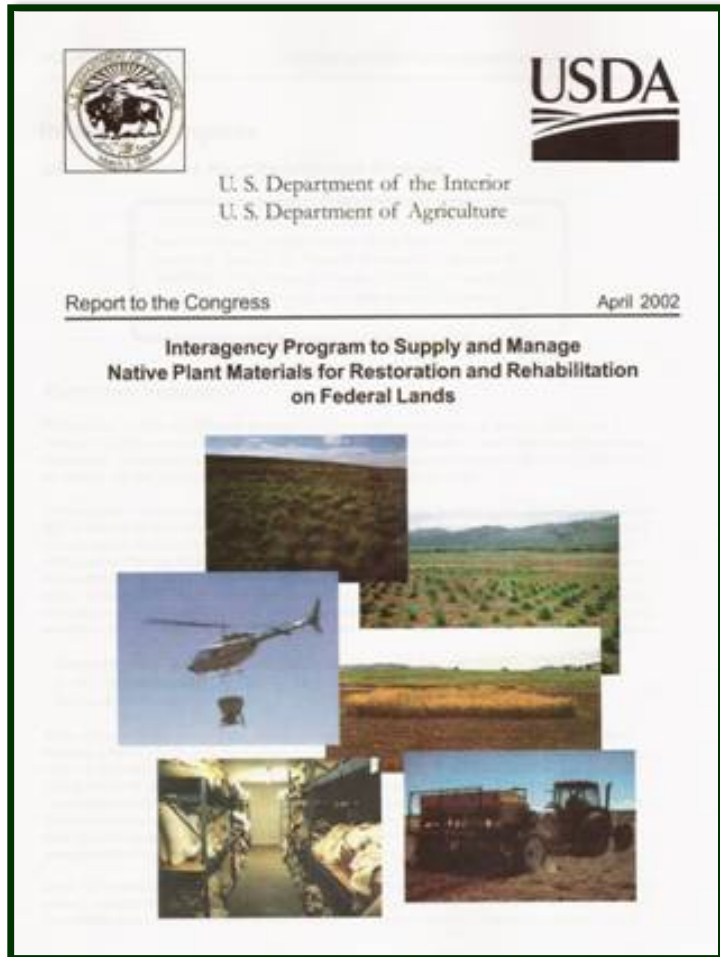
USDA and USDI strategy for
addressing short and long-term
native plant needs

Great Basin Restoration Initiative

Proactive, landscape-scale
restoration program

Great Basin Native Plant Selection and Increase Project

Collaborative public/private
plant materials program



Progress from Partnerships...

Goals

- Increase the availability of native plant materials, particularly native forbs
- Develop techniques for repairing disturbed plant communities to create diverse, functional ecosystems



University of Idaho



Region 6



Restoration goals:

- **Emphasis on Wyoming big sagebrush**
- Repair ecological processes and function
- Native diversity/integrity
- Increased stability
- Resistance to invasives
- Resilience
- Non-catastrophic fuels/fire management



Native Plant Program Elements:

- Needs assessment/species selection/plant materials
Which, from where, and how much?
What about climate change?
- Cultural practices
For agricultural seed production
- Ecological restoration
Multiple disturbances – multiple species – multiple issues
- Science delivery
Where's the info?



Species Selection: Considerations

- Scale: Local disturbance, seed zone, ecoregion
- Site condition
- Specific objectives

- Agricultural potential, quantities needed



Ecological Genetics - Species-specific Seed Zones

Evidence for adaptation –
Correlation between traits and source environments

RC Johnson et al., *Allium acuminatum*

Collect
seed
from
many
sources



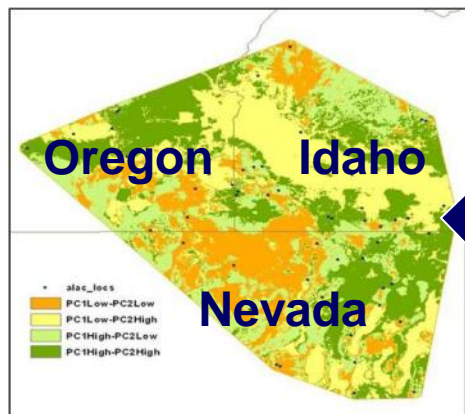
Grow families in
common
environments



Measure many
adaptive traits



Seed
zone
map



GIS

Correlations of selected plant traits from common garden with environmental variables at source location for *Allium acuminatum* ($P < 0.05$, $n = 55$)

Trait	Latitude	Elev	Ann precip	Frost free days	Ave temp
Bolting date	-0.084	0.373	0.336	-0.414	-0.523
Bolting to flowering days	0.173	-0.515	-0.442	0.469	0.484
Flower color	-0.308	0.312	-0.008	-0.124	-0.053
Flowers per umbel	-0.180	0.344	0.097	-0.375	-0.230
Length to width CF	0.317	-0.340	-0.078	-0.029	0.038
Number	0.356	-0.011	0.469	-0.104	-0.277
Leaf width	-0.313	0.267	0.100	0.070	0.068
Seeds per plant	0.194	0.131	0.427	-0.379	-0.325
Scape diameter	-0.252	0.342	0.175	-0.165	-0.075
Scape length to diameter	0.159	-0.335	-0.313	0.107	0.073
Scape length	-0.055	-0.051	-0.215	-0.044	0.014
Survival	0.019	0.320	0.333	-0.425	-0.469
Umbel diameter PU	-0.196	0.196	-0.030	-0.052	-0.036

Trait vs
source
environment

Collaborative Genecology Studies

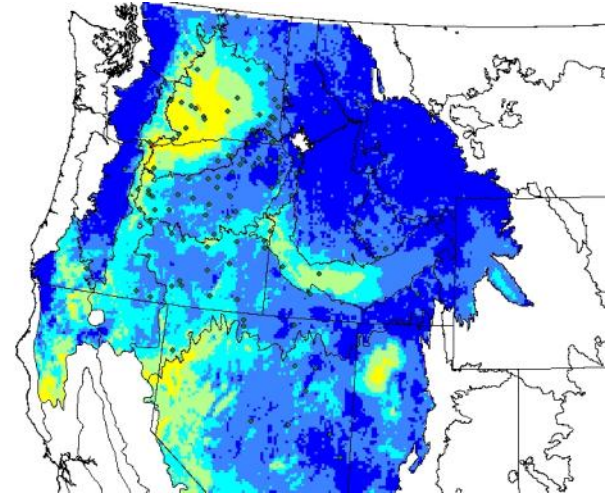
- 7 grasses, 7 forbs and 3 shrubs
- Results provide maps/materials for large areas
- Partners
 - FS PNW – Corvallis
 - ARS – Pullman
 - FS RMRS – Boise
 - University of Nevada - Reno



Big sagebrush

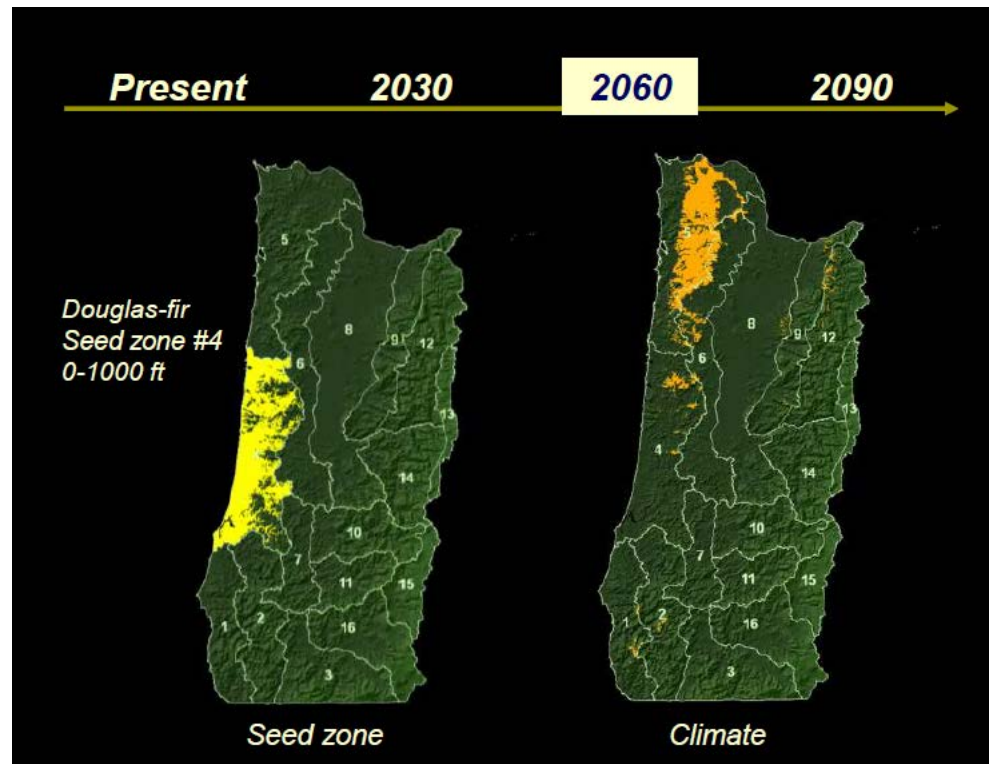


Bluebunch
wheatgrass



How do we help plants adapt to future climates?

- Enhance genetic diversity
- Promote natural migration and gene flow
- Deploy populations adapted to future climates (genetic outposts, assisted migration)
- Conserve genetic diversity (in situ and ex situ)



Slide: Brad St. Clair,
FS PNW

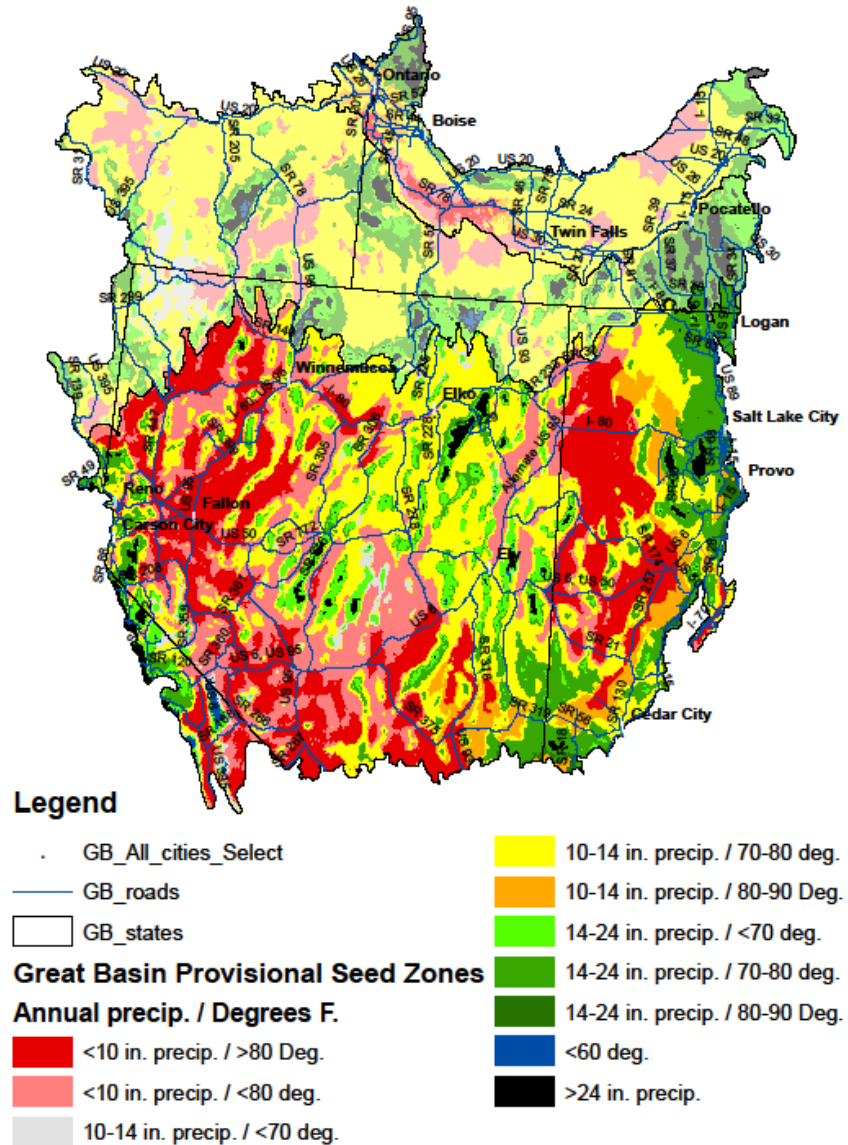
Figures:
Lauren Magalska,
OSU

Species Selection:

Great Basin Provisional Seed Zones

Based on:

- Annual precipitation
- Average maximum daily summer temperature
- Omernik ecoregions
- Local knowledge



(A. Bower et al. 2011)

Western Wildland Environmental Threat Assessment Center Seed Zone Mapper

Provisional Seed Zones

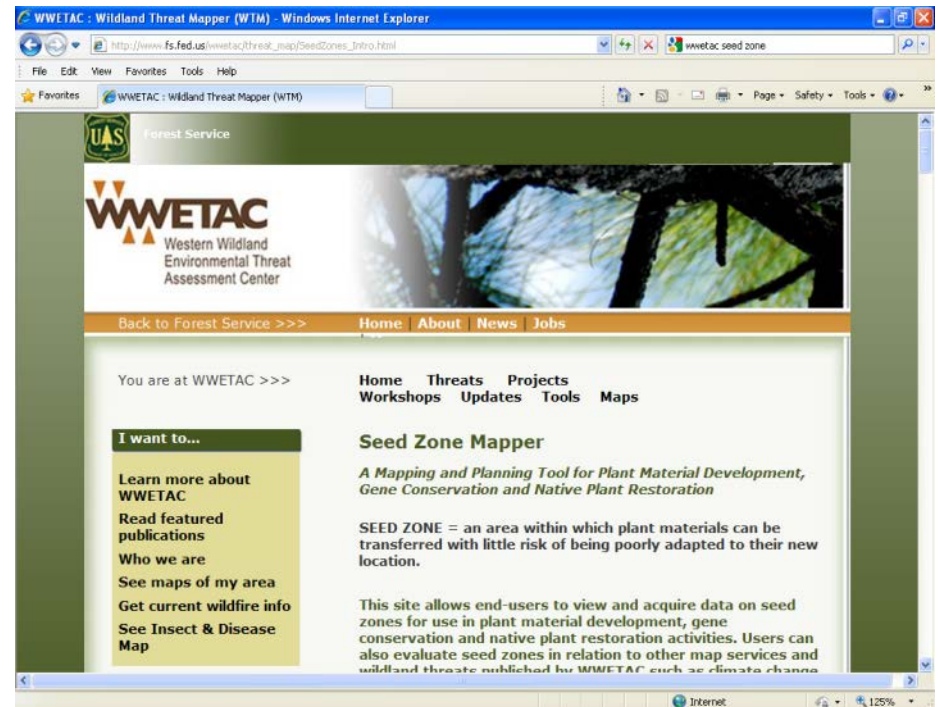
- Nation wide
- Regional

Empirical Seed Zones

- Eight species to date
- Literature for each

Map Formats

- GeoBrowser
- Google Earth GeoBrowser
- Google Earth KML
- MXD (Arc Map)



Cultural Practices for Agricultural Seed Production

Stand Establishment



- Seed technology
- Soil requirements
- Seed pretreatments
- Seeding equipment
- Seeding date, rate, depth
- Row spacing
- Seeding strategies
- Nursery propagation and transplanting



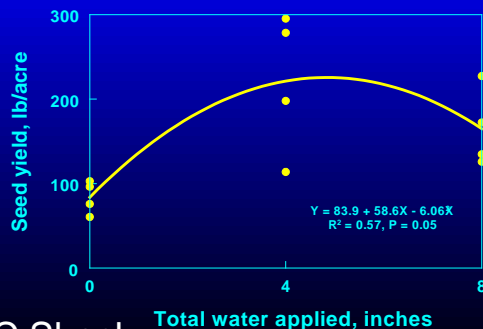
Cultural Practices for Agricultural Seed Production

Stand Maintenance

- Weed control
- Irrigation
- Seed predators
- Diseases
- Pollinators
- Harvesting



Royal penstemon average seed yields over three years in response to subsurface drip irrigation.



C Shock



J Cane



J Cane

Cultural Practices

Collaborators

- Oregon State University Malheur Experiment Station
- Utah State University
- ARS Pollinating Insects Research Unit
- University of Idaho (pathology)
- Colorado State University Extension (insect predators)
- ARS Forage and Range Research Lab
- RMRS GSD Boise and Provo



Sulphur-flower buckwheat



Nineleaf biscuitroot



Royal penstemon

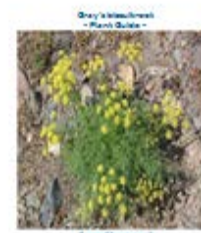
Native Plant Materials for Great Basin Restoration

USDA Natural Resource Conservation Service Plant Guides & Fact Sheets

Grasses



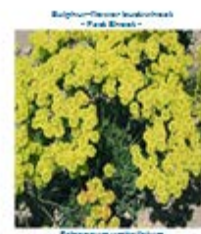
Forbs



OSU Malheur Experiment Station Plant Fact Sheets

COMING SOON!

COMING SOON!



Initial Seed Increase



Private Growers



USDA
Forest Service
Nursery



ARS Forage and Range Lab

USDA
Plant
Materials
Center



Commercial Production



Eagle Yarrow
S Young

Grasses

- Anatone bluebunch wheatgrass
- Fish Creek squirreltail
- Toe Jam Creek squirreltail
- Mt. Home Sandberg bluegrass
- Tetra Great Basin wildrye
- Thurber's needlegrass
- Needle and thread



Forbs

Scientific name	Common name	Ecoregion
<i>Achillea millefolium</i>	Eagle western yarrow	SRP
<i>Astragalus filipes</i>	NBR-1 Basalt milkvetch	NBR, SRP
<i>Balsamorhiza hookeri</i>	Hooker's balsamroot	CBR
<i>Balsamorhiza sagittata</i>	Arrowleaf balsamroot	CBR
<i>Chaenactis douglasii</i>	Douglas dusty maiden	NBR, SRP
<i>Dalea ornata</i>	Western prairie clover	NBR, SRP
<i>Dalea searlsiae</i>	Searl's prairie clover	CBR
<i>Eriogonum heracleoides</i>	Wyeth buckwheat	NBR, SRP
<i>Eriogonum umbellatum</i>	Sulphur-flower buckwheat	NBR, SRP
<i>Linum lewisii</i>	Maple Grove Lewis flax	CBR

SRP = Snake River Plain, **NBR** = Northern Basin and Range, **CBR** = Central Basin and Range

Forbs

Scientific name	Common name	Ecoregion
<i>Lomatium dissectum</i>	Fernleaf biscuitroot	NBR, SRP
<i>Lomatium grayi</i>	Gray's biscuitroot	SRP
<i>Lomatium nudicaule</i>	Barestem biscuitroot	NBR, SRP
<i>Lomatium triternatum</i>	Nineleaf biscuitroot	NBR
<i>Machaeranthera canescens</i>	Hoary tansy aster	NBR, SRP
<i>Penstemon acuminatus</i>	Sharpleaf penstemon	NBR, SRP
<i>Penstemon cyaneus</i>	Blue penstemon	SRP
<i>Penstemon speciosus</i>	Royal penstemon	NBR, SRP
<i>Sphaeralcea coccinea</i>	Scarlet globemallow	CBR
<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf globemallow	CBR
<i>Sphaeralcea munroana</i>	Munro globemallow	NBR, SRP

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Wildland Seedings

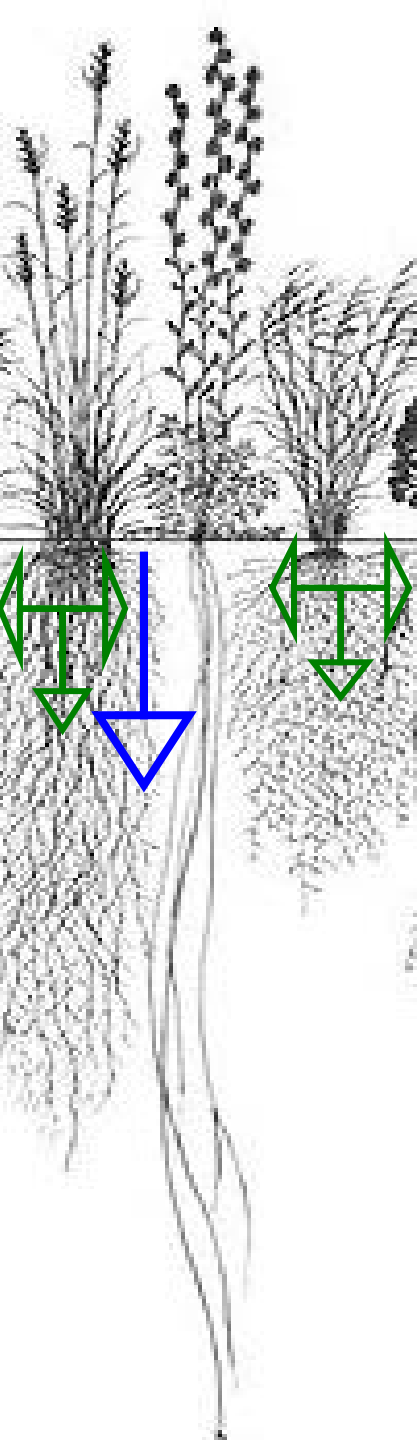
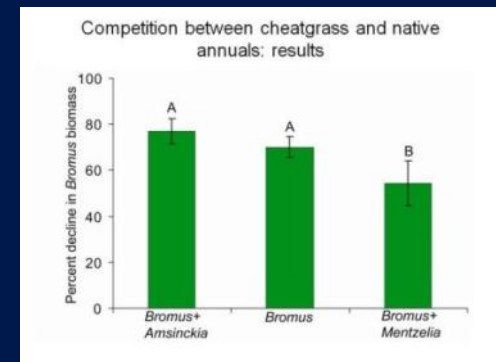
Autecology studies

- Germination, emergence, and establishment requirements
- Growth habit, growth rate
- Plant functional traits
- Response to environmental variables



Species Interactions

- Successional status
- Interaction with invasives
 - Resilient communities
- Interactions among seeded species
 - Compatibility





Equipment and Strategies for Post-fire Seedings in Wyoming Big Sagebrush Communities



Objectives

- Drill comparison
 - > Reduce surface disturbance
 - > Conserve residual natives and biological soil crusts
- Improve establishment of small-seeded species
- Test big sagebrush seeding strategies
- Examine dust emissions, impacts on soil physical and chemical properties

Rangeland drill



Minimum till drill



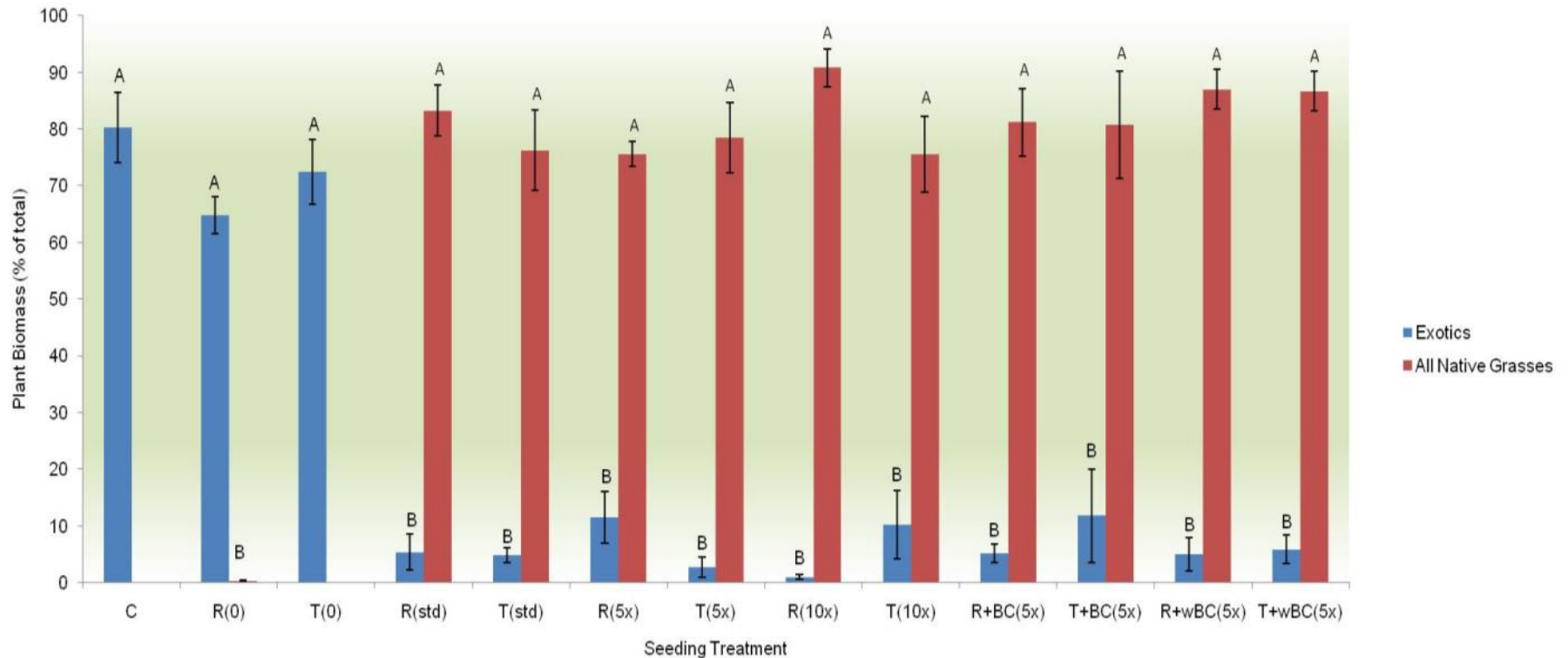
Major Findings:

- Precipitation critical
- Clean seedbed critical
- Residual perennials – many recover
- Rangeland drill – improves drilled species density
- Minimum-till drill with impacter units – improved small-seeded species emergence
- Fall and winter hand broadcasting (aerial seeding) - erratic
- Sagebrush density increased with higher rates, better with minimum-till drill



Scooby Seeding 2010

Biomass of Seeded Grasses and Invasive Weeds



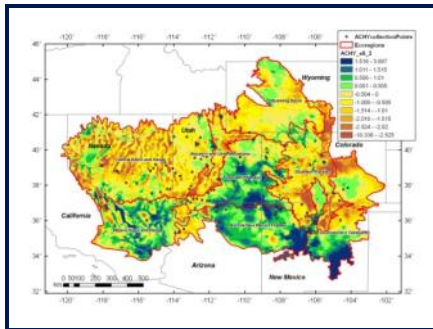
Science Delivery



- Manuals
- Manuscripts
- Plant guides



- Websites
- Technical notes
- Videos
- Equipment



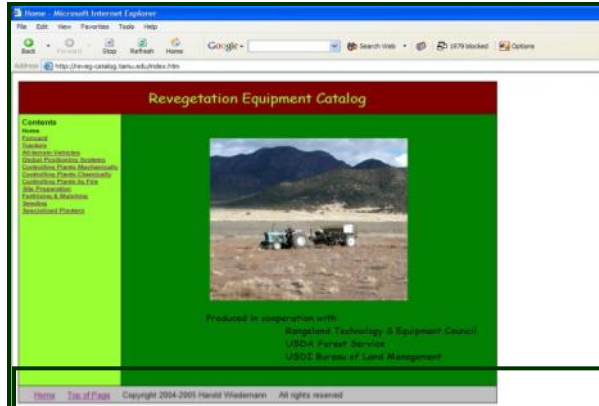
- Native seed
- Seed zones/seed transfer guidelines



- Workshops
- Symposia
- Field tours
- US and international contacts

Websites

Developed by GBNPSIP Cooperators:



- Revegetation Equipment Catalog
- Western Colorado Entomology Native Plant Seed Production
- Native Wildflower Seed Production
- Seed Zone Mapper

Contributions from GBNPSIP Cooperators:

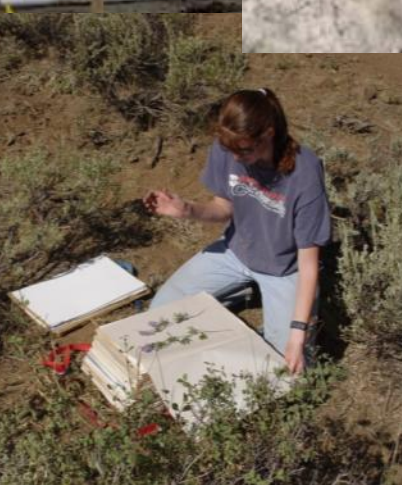
- Seed Testing Protocols
- AOSA Test Method for Species without Rules
- Native Plant Propagation Protocols
- Seeds of Success



***Links on GBNPSIP
webpage and brochure***

Student research:

- Undergraduate mentoring and intern programs
- Graduate students, post-docs



Acknowledgements



USDI Bureau of Land Management,
Native Plant Materials
Development Program and
Great Basin Restoration Initiative



GBNPSIP Cooperators
(particularly those from whom
I've swiped photos)

GSD-Boise Technicians

Questions?

