# What Seed Should I Grow?

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Nevada Native Seed Forum

Sparks, Nevada

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# Outline

- Background on Nevada Native Seed Partnership

- Why we need better seed for Nevada

- What the Nevada Native Seed Partnership is doing to help you

- Where we heading in Nevada

- Considerations for positioning yourself for success

- Some resources to help

# Who Are We?
## Nevada Native Seed Partnership

- Restore ecosystem function species diversity and services

- Lower the cost of native seed

- Improve native seed market

- More species and genetically appropriate sources

- Build a Nevada industry and economy

**Right Seed**
**Right Place**
**Right Time**

# Why don't we have better seed: Plant Blindness

## We have an unconscious bias against plants

- Plant awareness is not hard wired into our physiology and sensory systems the same way that it is for wildlife.
- Plants are generally a non-threatening part of the environment
- People typically know less about plants than animals
- Plant awareness requires a mentor, especially in urban areas.



*Wandersee and Schussler 1999; 2001*

# Animal Bias: Many folks think about plants like wildlife, but...

Plants function differently in space and time than animals :

- Plants are stationary and exposed, with relatively high genetic selection pressure

- Plants have below ground structures and dynamics – seed banks, corms, tubers and mutualisms (mycorrhizae and rhizobia)

- Plants have different dispersal and migration characteristics

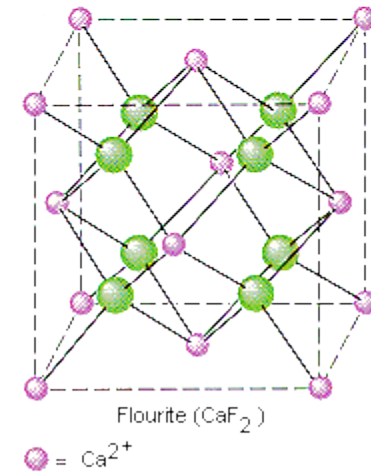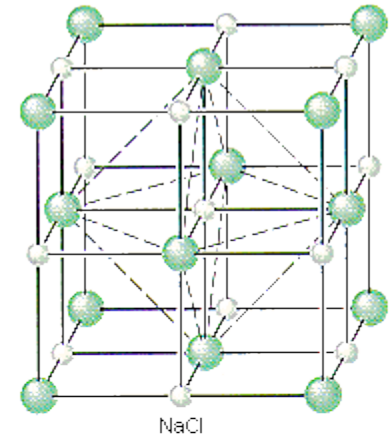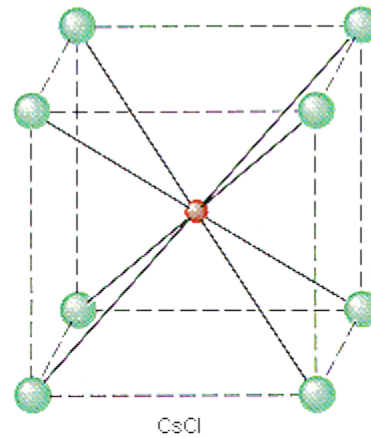- Plants have a variety of specialized reproductive systems

# More differences…

- Plant populations are often smaller, with greater genetic variation between populations

- Plant populations are more vulnerable to local threats

- Plants have more complicated life histories and more symbioses and mutualisms with other species

- Plants often respond with genetically fixed adaptations to changes in their environment

# Ecosystem Structure and Function built by species diversity

An **ecosystem** is the biota (plants, animals, and microorganisms) within a given area, the environment it sustains, and their interaction

Native seeds are the key to creating diversity within an ecosystem



CsCl

NaCl

Flourite (CaF$_2$)

$\bigcirc$ = Ca$^{2+}$

Rutile (TiO$_2$)

$\bigcirc$ = Ti$^{iv}$
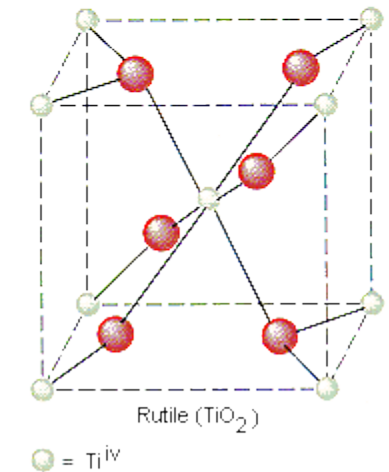
# Another way to think about ecosystems ...



THE SAGEBRUSH SEA: FOOD WEB

TOP PREDATORS/SECONDARY AND TERTIARY CONSUMERS
- AMERICAN BADGER
- COYOTE
- NORTHERN HARRIER

SMALL CARNIVORES/SECONDARY CONSUMERS
- SAGE THRASHER
- SAGEBRUSH LIZARD
- PRAIRIE RATTLESNAKE

HERBIVORES/PRIMARY CONSUMERS
- SAGE-GROUSE
- PRONGHORN
- HARVESTER ANT
- PYGMY RABBIT

PRIMARY PRODUCERS
- SAGEBRUSH
- CACTUS
- DESERT WILDFLOWERS
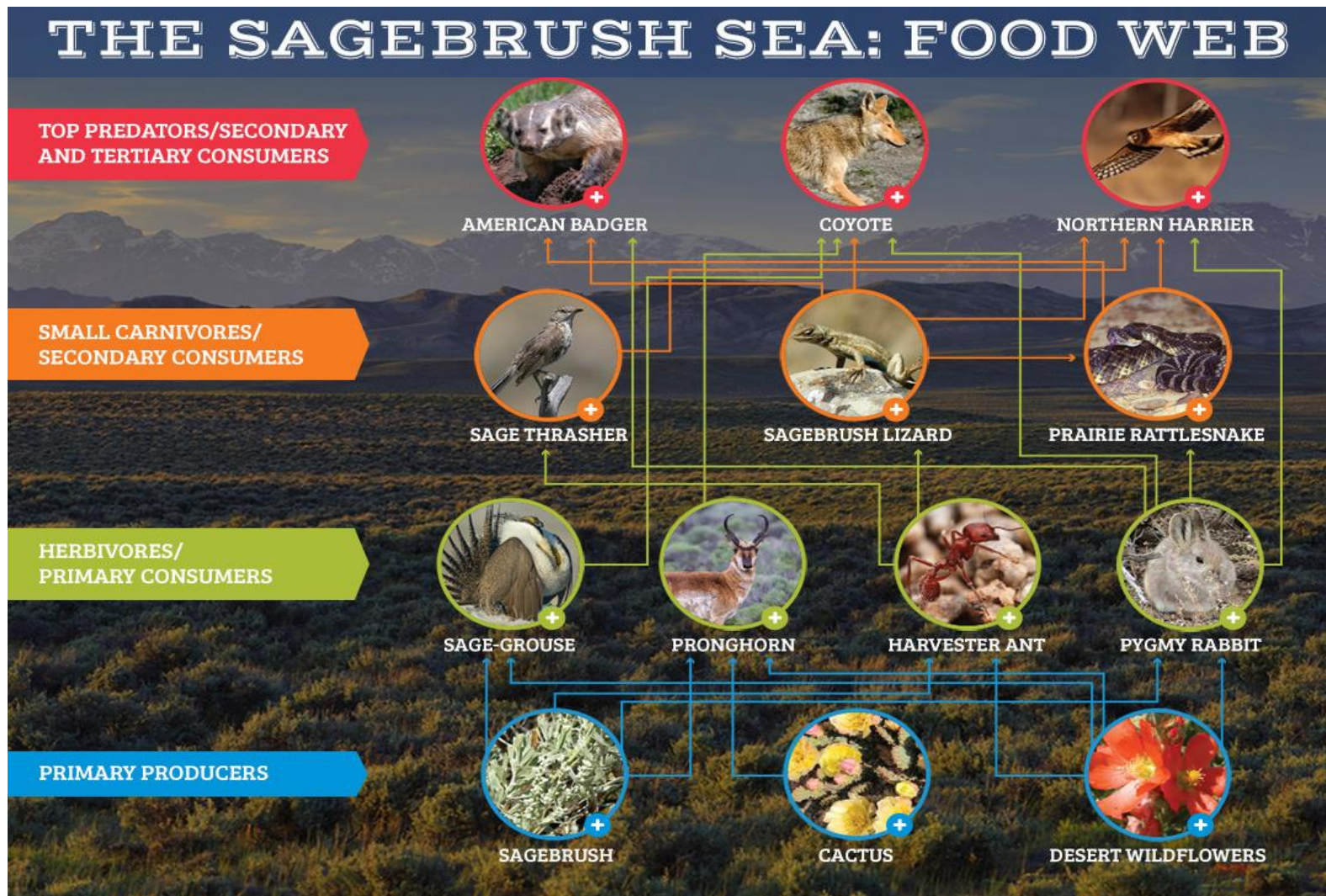
# How do you measure ecosystem health?

Plant species richness and abundance is the best indicator of healthy ecosystems

Seeding is the fastest way to get species back into ecosystems

More species = more interactions = more/better services



*Scherber et al. 2010*
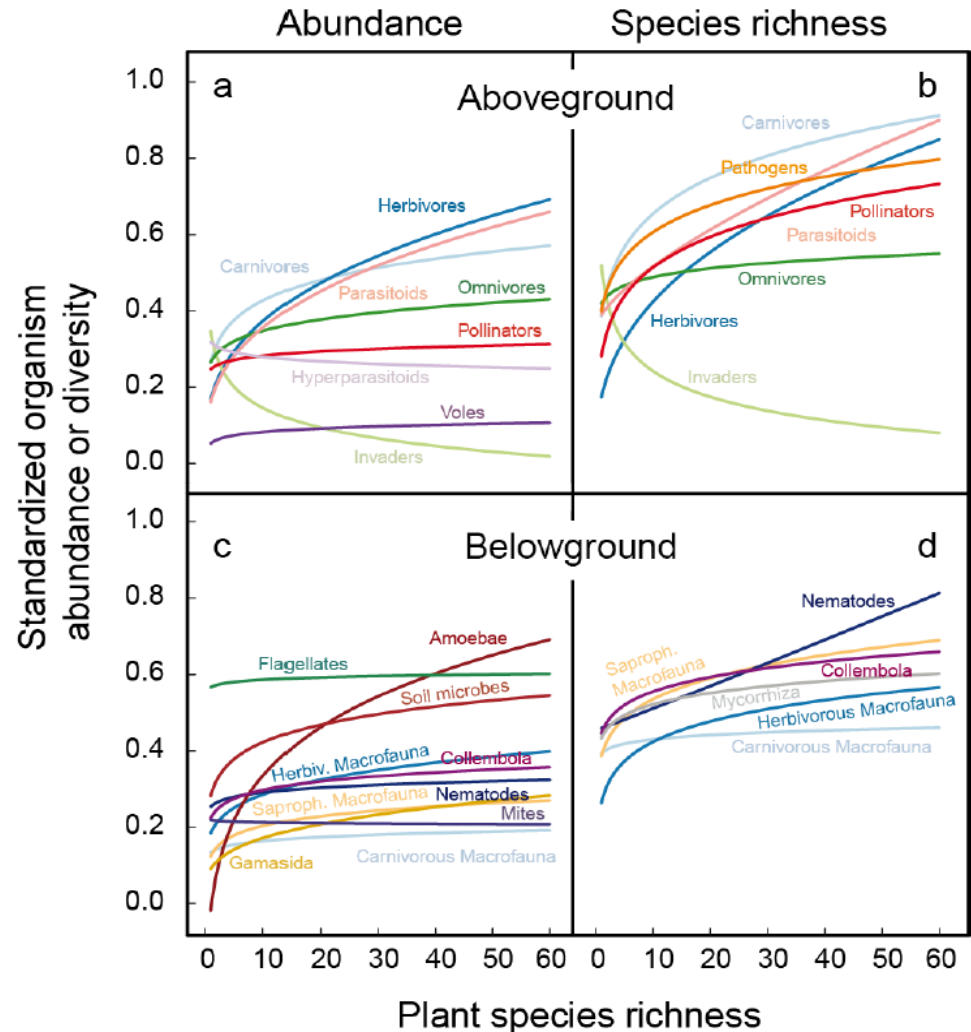
# Different Ecosystems: why crested wheatgrass works, yet does not quite work

| Why it Works | Why it Doesn't Work |
|---|---|
| Non native adapted to highly competitive and high disturbance ecosystems in Asia | Does not share have functional connections with native species |
| Germinates and Establishes Quickly | Can create monocultures that are harder to remove than cheatgrass |
| Competes with cheat grass, but then so do some natives | Outcompetes native species and inhibits/delays natural succession |

# Ecosystems are not static, they change and adapt

Evolutionary ecology: considers how interactions shape species and the consequences of the resulting evolutionary change.



Exist as a dynamic equilibrium

big changes = new ecosystem
little changes = local adaptation

# Local Adaptation is Real

**Wyoming Big Sagebrush Survival from 13 Locations Planted in Glenns Ferry, ID in 1987**

**Sands and Moser 2013**
**Germino et al. 2018**
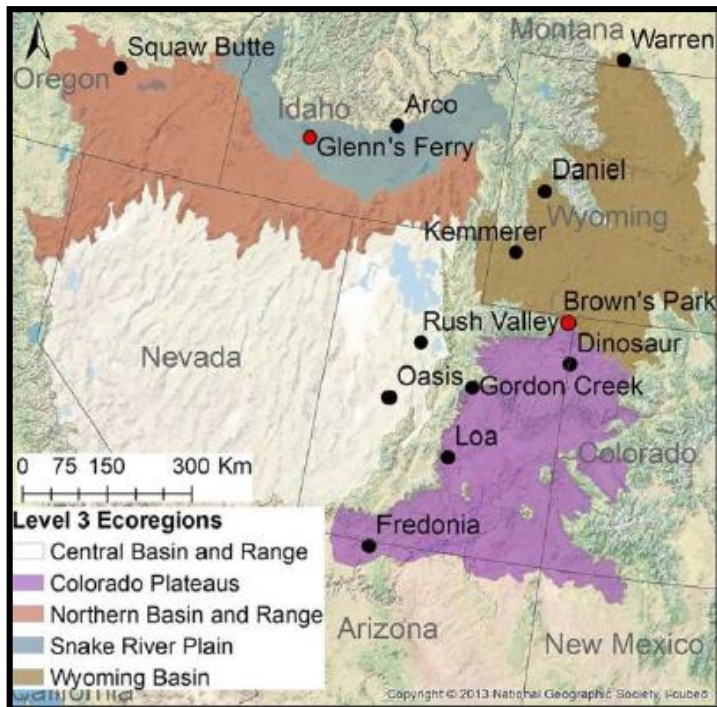




**Proportion of Plants Alive in 2010**
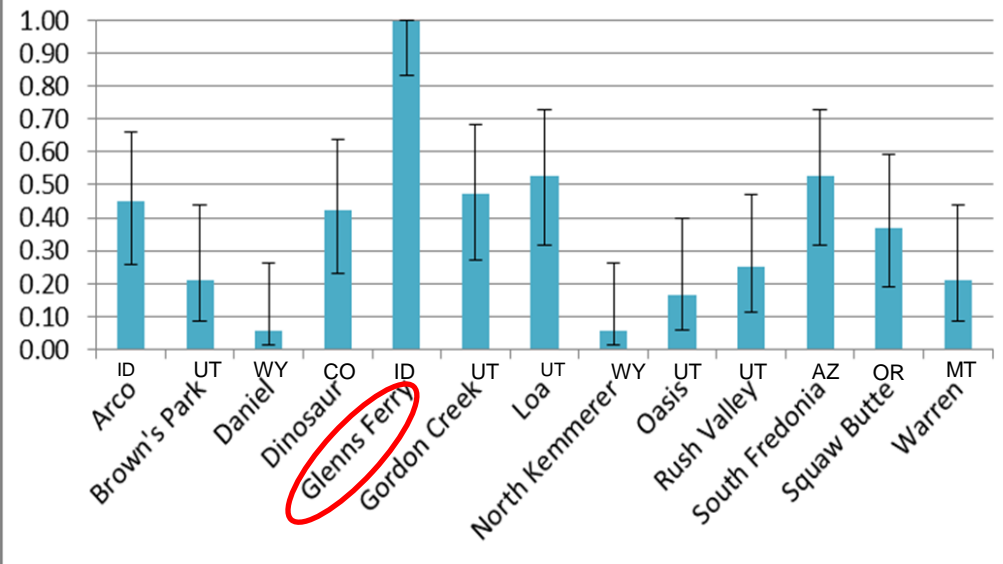
**Black** symbols source populations; **red** symbols common garden locations

# Local Adaptation is Real

**Macranthera canescens**

# Wyoming Sagebrush Empiric Seed Transfer Map

## Explains:

Results observed by Sands and Moser

Why BLM sagebrush seedings often fail

Improves cost effectiveness of treatments



*Richards and Chaney 2018*
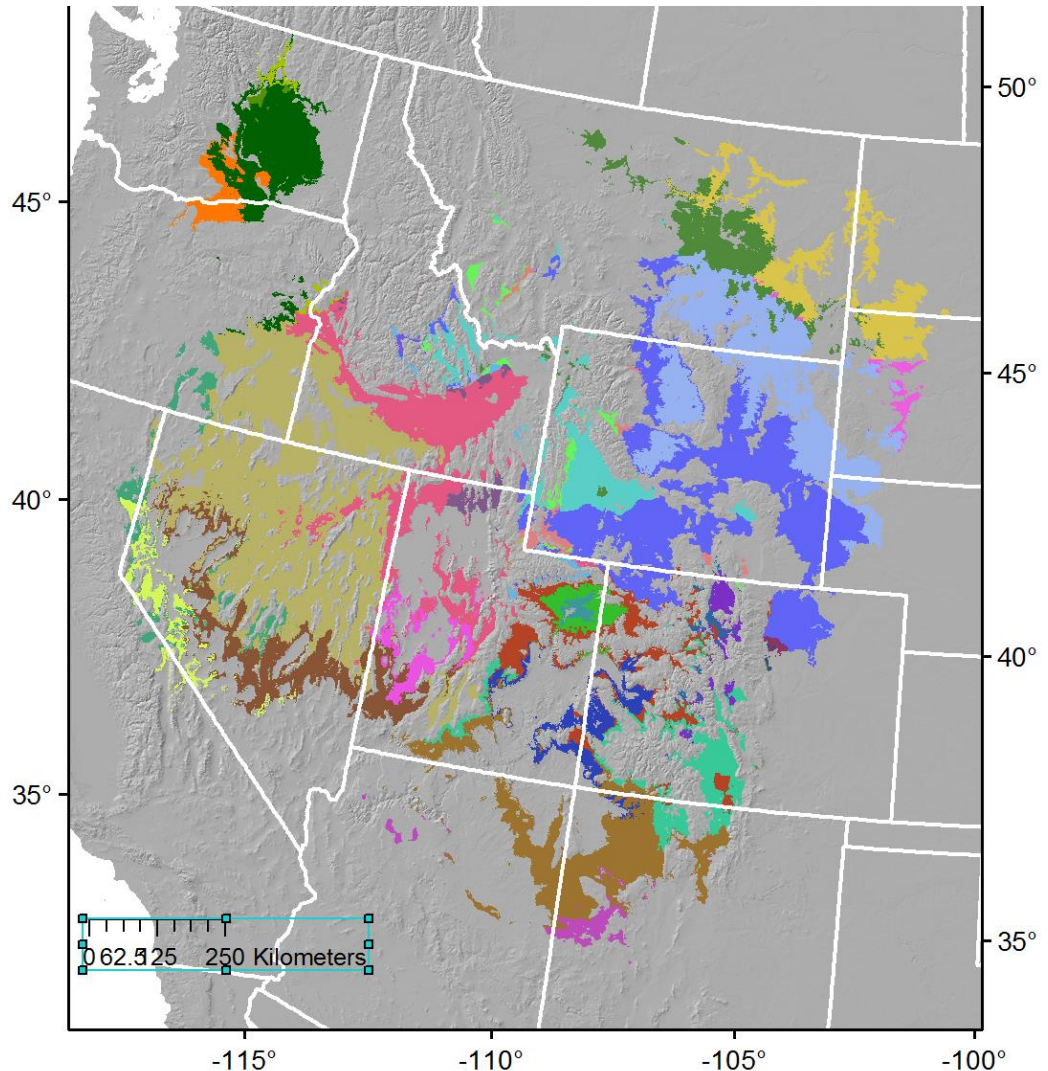
# Seed Zones:
## Best compromise for addressing local adaptation

- A mapped area with a fixed boundary which seeds or plant materials can be transferred for the best chance of success

- Developed in the 1920s

- USFS Policy in the 1960s

- Provisional: based on minimum winter temperature and aridity

- Empiric: provisional + a species' genetic variation
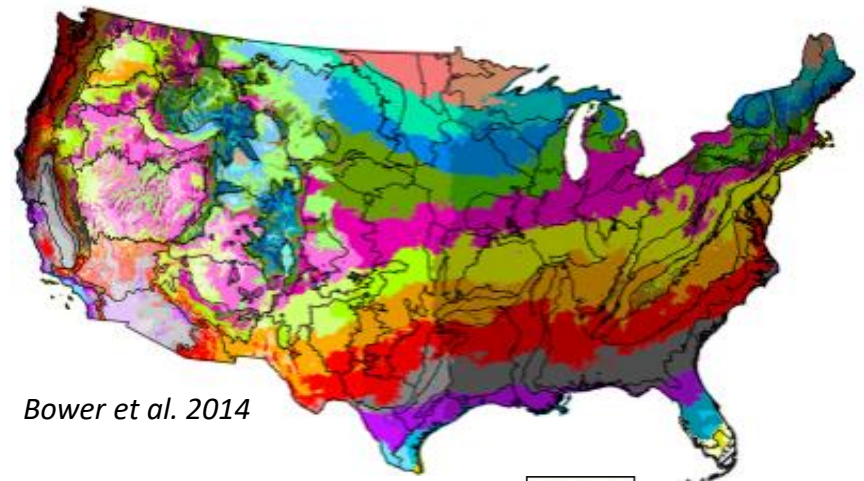


*Bower et al. 2014*
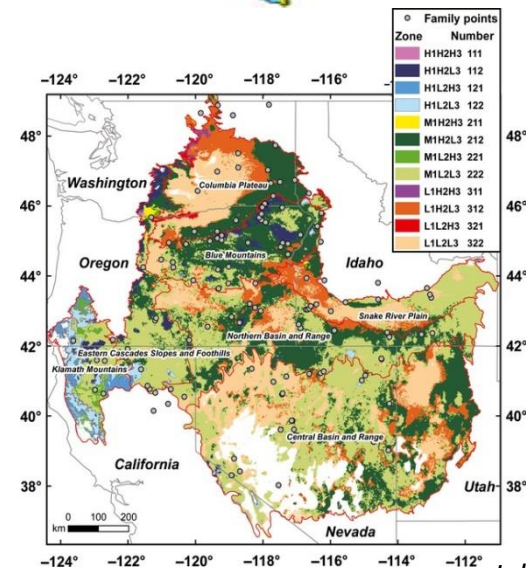


*Johnson et al. 2015*

# Where does most seed come from in the Great Basin?

- Mostly grasses
- Mostly cultivars
- Mostly from the northern, wetter edges of the Great Basin
- Selected for agronomic or forage qualities
- Shrubs and a few forbs are mostly wildland collected



*Leger and Baughman 2015*
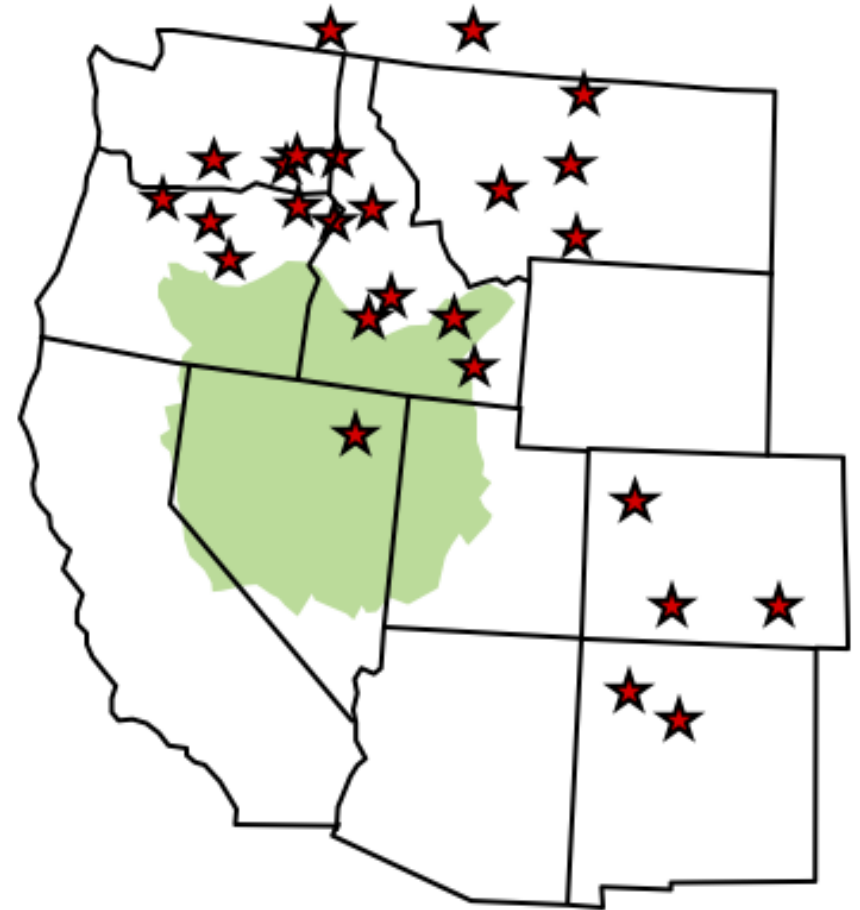
# How Varieties are Developed



Data from 90 cultivars

Legend: Grasses, Forbs, Shrubs

X-axis: Number of times trait mentioned (0, 10, 20, 30, 40)

Traits (top to bottom): Forage yield/quality, Seed yield, Seedling vigor, Establishment and persistence, Drought/semiarid tolerance, High/fast germinability, Large/useful adapted range, Plant height, Specific/uniform phenology, Disease tolerance, Competitive with exotic annuals, Nothing mentioned, Seed harvestability, Genetic diversity, Seed mass, Sod-forming, Cold tolerance, Beauty, Salt tolerance, Good on contaminated soil

*Leger and Baughman 2015*

# What is the Nevada Native Seed Partnership doing to help you?

- Seed collections- priority species

- Seed transfer zones analysis – priority analysis

- Seed certification

- Research and Development

- Nevada Seed Strategy (in progress)





SOURCE IDENTIFIED SEED

NDA
Nevada Department
of Agriculture

MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES
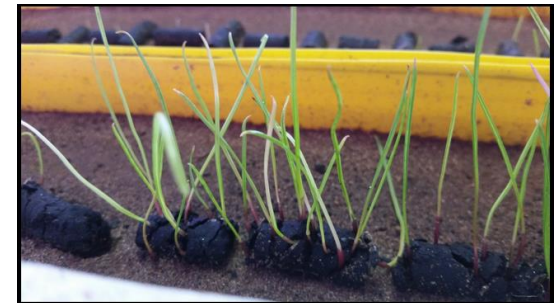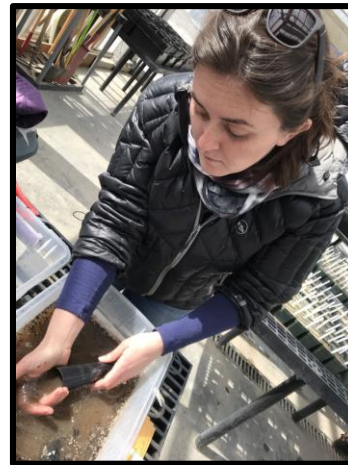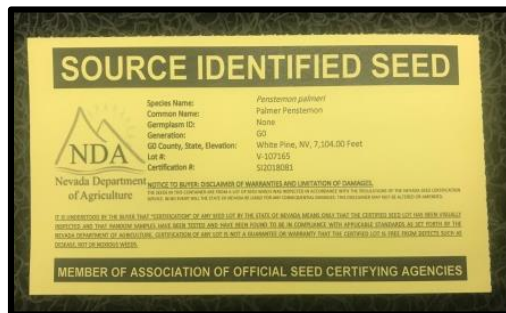
# Where are we Heading in Nevada?
## Short term  (5-10 years)

- Advance the use of best available science – seed zones, species compatibility, seeding techniques and technologies, etc.
- Have Nevada growers growing Nevada native seed
- Increase availability and variety of native seed sources
- Capture local adaptation from different seed zones using local seed collections
- Rely more on natural track and pre-varietal germplasms
- Coordinate public and private native seed needs
- Develop seed transfer guidance for forbs (wildflowers)

# Where are we Heading in Nevada?
## Long term  (10-20 years)

- Development of ecologically based varieties

- Genetic management plans for workhorse species

- Rotating collection schedule for seed sources

- Stabilization of native seed demand

# How to Position Yourself For Success:
## Considerations for Species Selection

- Deciding what native species to grow is one of the first steps

- Species Selection Considerations:
  - Have utility in reclamation, rehabilitation, and restoration
  - In demand by agencies
  - Produce seed well in agricultural settings

- Seed Source Selection Considerations:
  - Seed transfer guidelines
  - Source identified seed

# How to Position Yourself For Success: Considerations for Field Establishment

- Field longevity
  - Different species will produce seed over different durations of time

- Manage weeds
  - There are weed content standards – Federal Seed Act

- Seed orchards on site may help increase seed available for increase in place of wildland collections
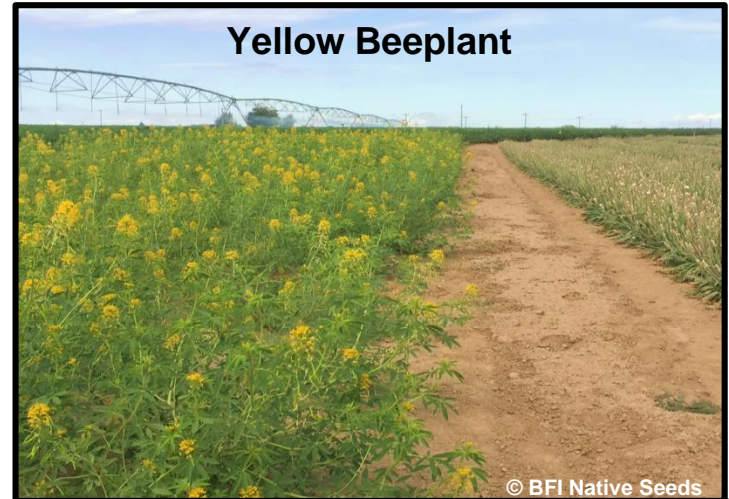

Yellow Beeplant
© BFI Native Seeds


Big Flower Agoseris
© BFI Native Seeds

- Certify the increased seed

- Coordinate and develop relationships

  - Relationships between seed purchasers and producers on priority species will help to reduce volatility in demand, help stabilize market price, and reduce grower risk

- Sell to a seed broker or vend directly to seed purchasers

# Resources to Help Growers

Synthesis of research produced by BLM and the GBNPP

Forb Manual expected end of 2019

Six fact sheets produced in FY18

Arroweaf balsamroot
Douglas dustymaidens
Hoary tansyaster
Sagebrush false dandelion
Royal penstemon
Gooseberryleaf globemallow

# Where can I find seed transfer guidance?
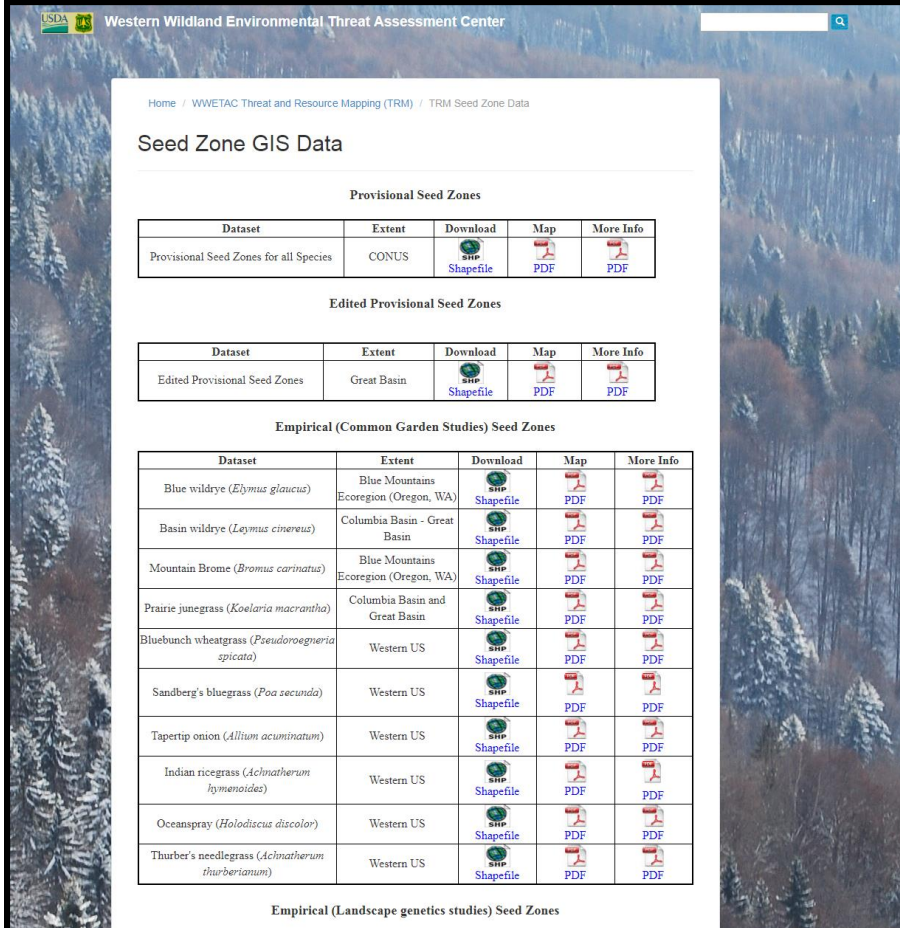
**All Seed Zones uploaded to:** Western Wildland Environmental Threat Assessment Center (WWETAC)

**https://www.fs.fed.us/wwetac/threat-map/TRMSeedZoneMapper.php**

Provisional Seed Zone Maps

Empirical Seed Zone Maps:

- Indian ricegrass

- Thurber's needlegrass

- Squirreltail

- Great Basin wildrye

- Sandberg's bluegrass

- Bluebunch wheatgrass

- Wyoming Sagebrush

- Basin Big Sagebrush

- Mountain Sagebrush (in a few months)

# What plants do sage grouse need:
## Sagebrush Forb Manual

- Produced by Rocky Mountain Research Station

- Supported by BLM

- Resource to help identify sage grouse species



**USDA** United States Department of Agriculture

**Common Native Forbs of the Northern Great Basin Important for Greater Sage-Grouse**

Tara Luna • Mark R. Mousseaux • R. Kasten Dumroese

Forest Service | Rocky Mountain Research Station | General Technical Report RMRS-GTR-387 | November 2018

# Additional Resources



https://www.blm.gov/programs/natural-resources/native-plant-communities/native-seed-and-plant-material-development



https://www.blm.gov/programs/natural-resources/native-plant-communities/national-seed-strategy

# Thank you!
## Nevada Native Seed Partnership

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# Questions?