



U.S. Department of Agriculture Agricultural Research Service

Forage and Range Research Laboratory

Three North American Legumes for the Great Basin: Basalt Milkvetch, Western Prairie Clover, and Searls Prairie Clover

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Our Mission:

Provide an array of improved plant materials and management alternatives for sustainable stewardship of rangelands and pastures in the western U.S.



Scientists:

**Genetics/Plant Breeding (6)
Molecular Biology (4)
Physiology/Ecology (2)**





Background



- **Thousands of acres burn each year in the Great Basin.**
- **Many land managers prefer a mix of diverse plant species for rangeland revegetation.**
- **Very few North American legumes are available for rangeland revegetation in the Great Basin.**
- **Identifying regional seed sources is beneficial for commercial seed production.**





Need for Native Legume Species

Important for:

- Nitrogen fixation
- Seeding diversification
- Wildlife habitat and grazing
- Native pollinators
- Highways and roads
- Home xeriscaping

➔ Targeted three legume species native to western North America.





Basalt Milkvetch - *Astragalus filipes*



- **Wide spread**
- **Upright habit**



- **Creamy, showy flower**
- **Good seed production**
- **No reports of toxicity**



Western Prairie Clover (*Dalea ornata*)



- Northern GB
- Upright habit



- Purple, showy flower
- Good seed production
- No reports of toxicity



Searls Prairie Clover (*Dalea searlsiae*)



- **Southern GB**
- **Upright habit**



- **Purple, showy flower**
- **Good seed production**
- **No reports of toxicity**



Objectives

- **Make diverse seed collections of three North American legume species**
- **Conduct common-garden and molecular genetics studies to identify populations for release to the commercial seed trade**





For Each Legume Species

- Collected seed, soil, and plant samples for the three legume species
- Recorded site and plant information for each collection
- Analyzed plant samples for animal toxicity (swainsonine, nitrotoxins, selenium)

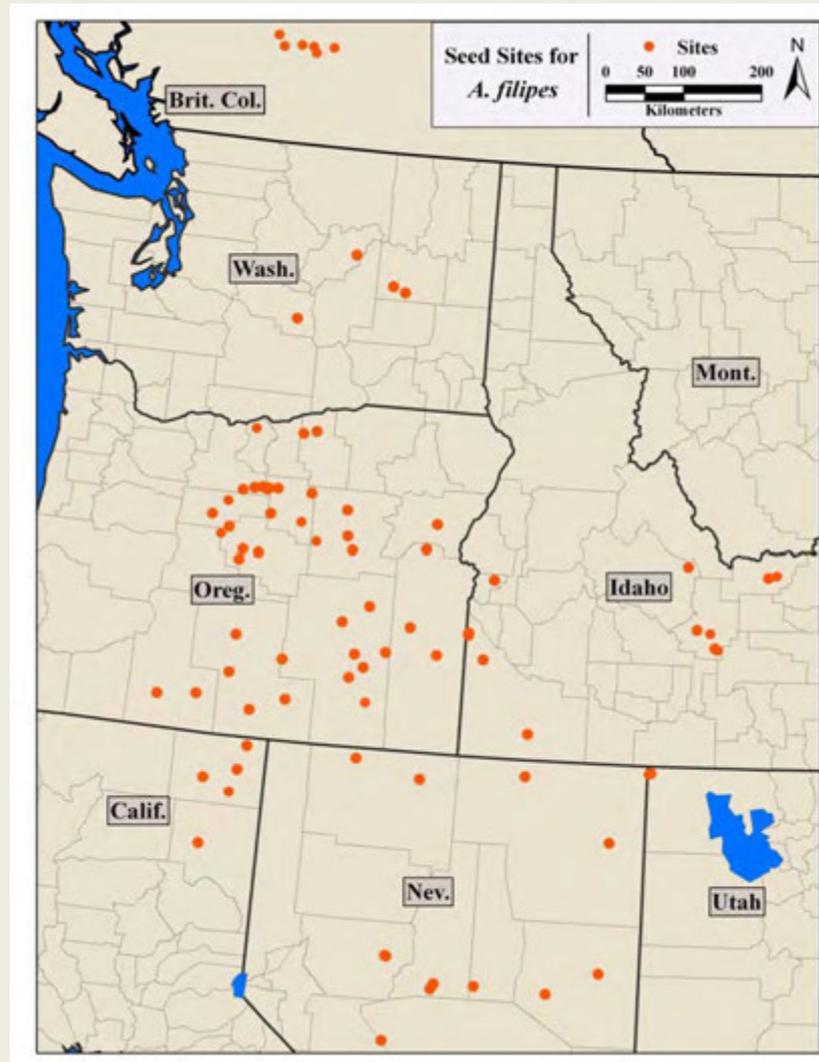
➔ No detectable levels or extremely low levels of toxic compounds in all three species.





Basalt Milkvetch Collections

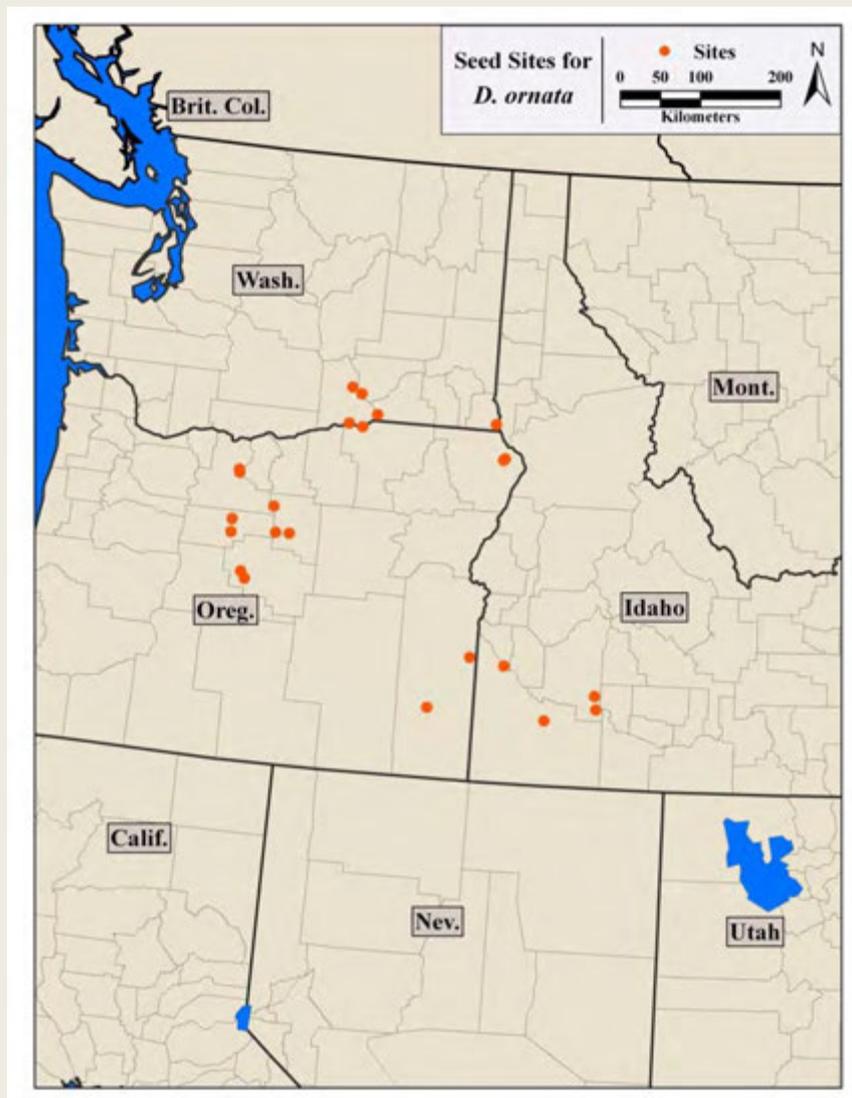
85 sites





Western Prairie Clover Collections

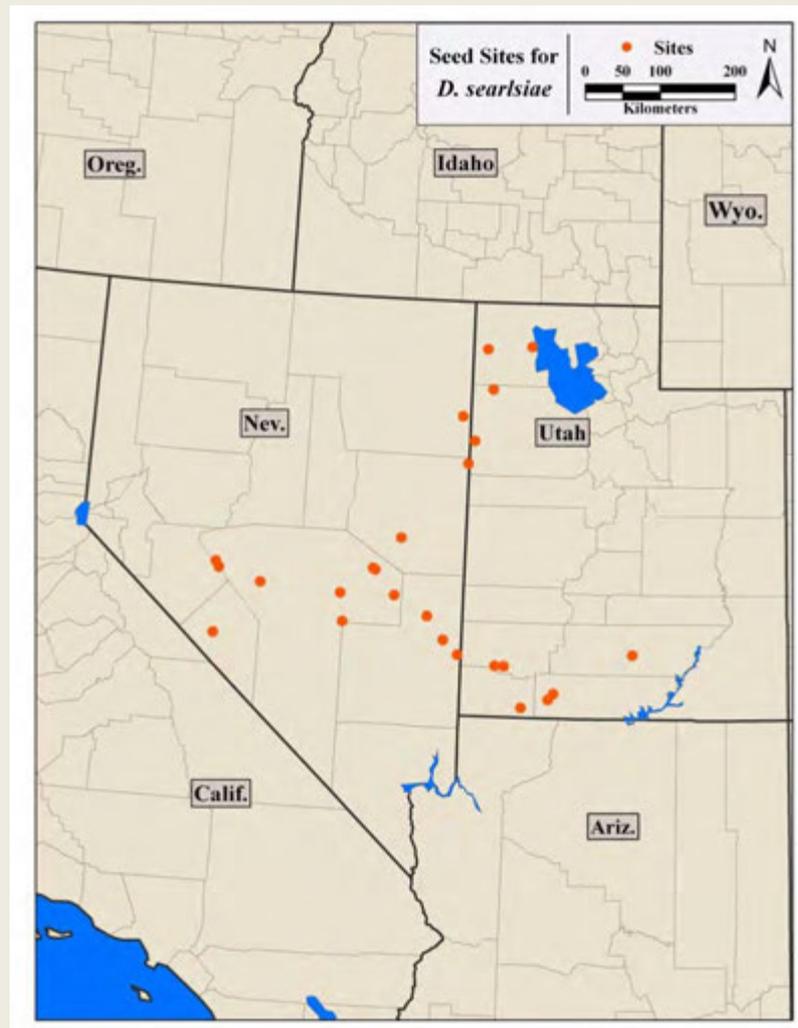
25 sites





Searls Prairie Clover Collections

25 sites





Common-Garden Field Data

Two Common Gardens for Plant Evaluations

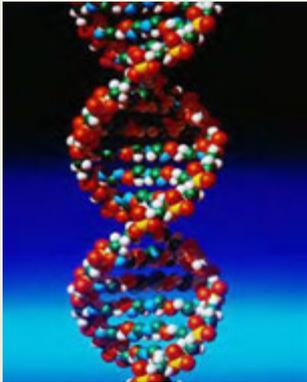


Two years of data
collection

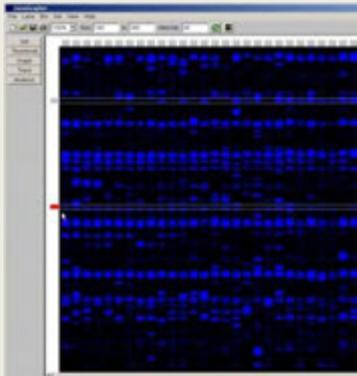
- Flowering date
- June biomass
- Plant height
- Plant vigor score
- Seed yield
- Fall regrowth
- Forage quality



Genetic Diversity Structure Determined For The Three Legume Species



- DNA procedures (AFLP) were used to determine the genetic diversity structure for each of the three legume species.
- Results from DNA analysis allowed grouping of collections with similar genetic background.



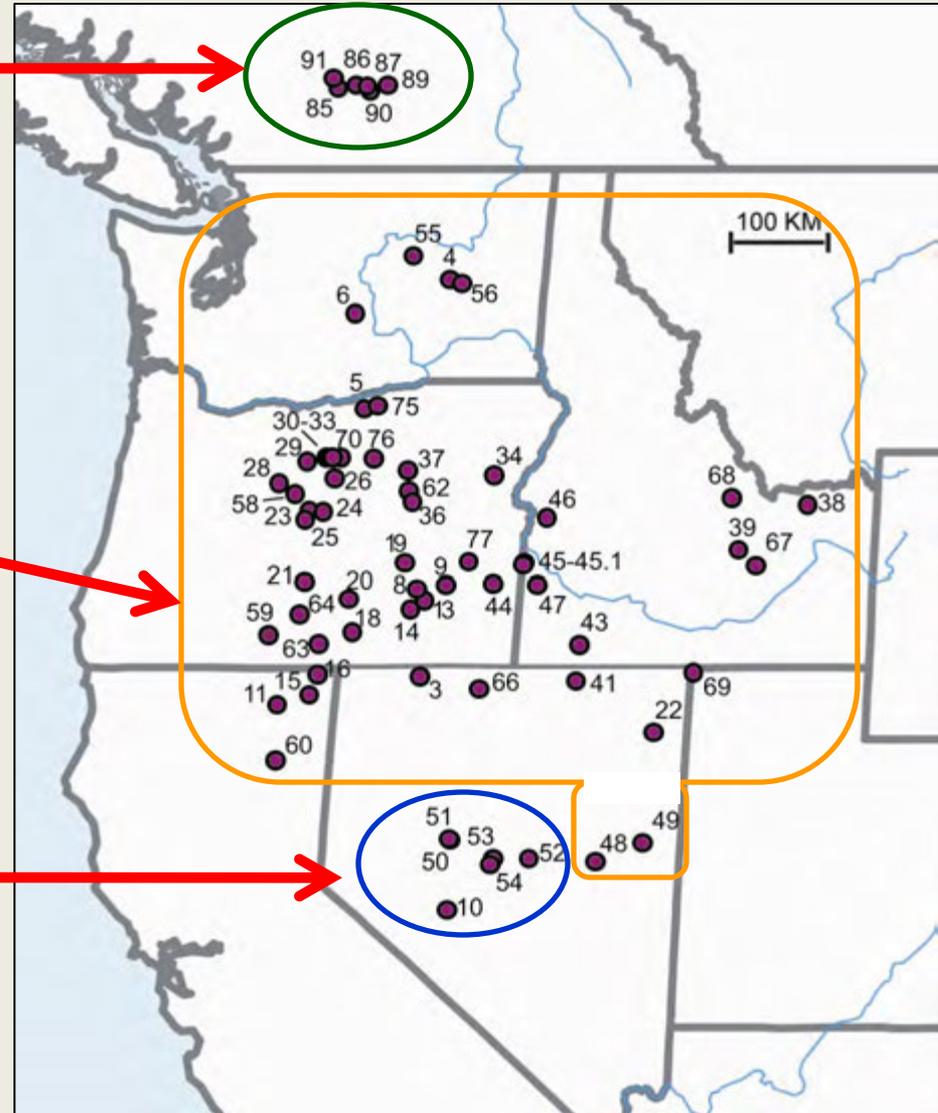


Release Strategy for Basalt Milkvetch

British Columbia

NBR-1
Germplasm

Southern Nevada



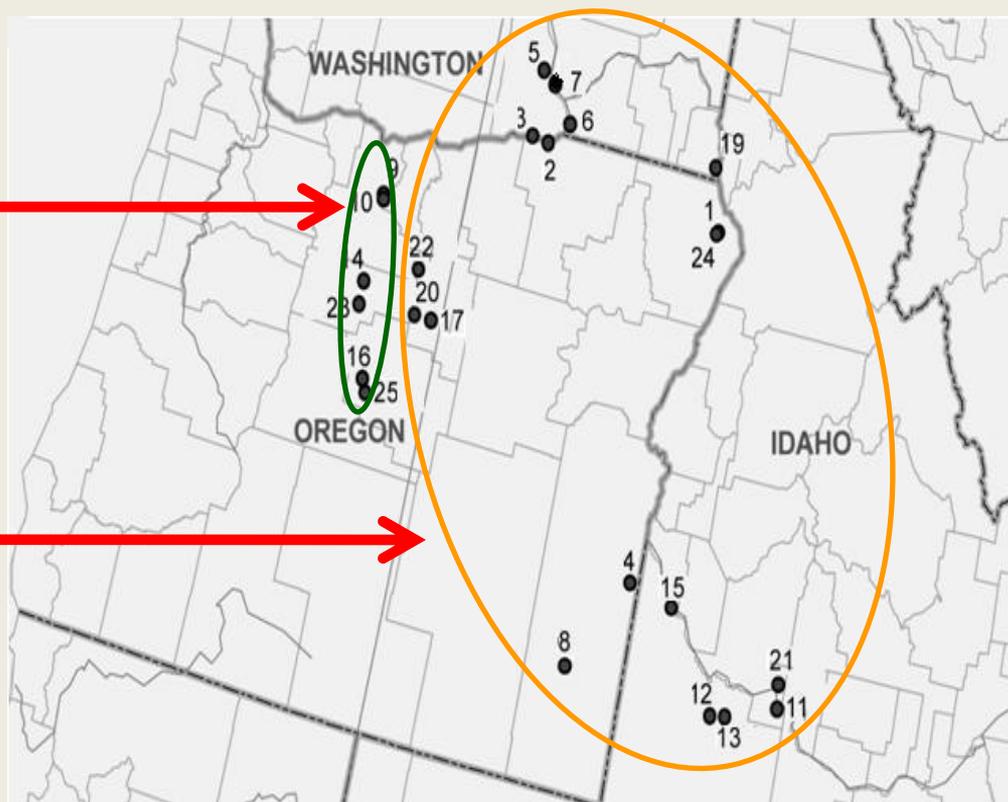


Release Strategy for Western Prairie Clover

**Majestic
Germplasm**



**Spectrum
Germplasm**

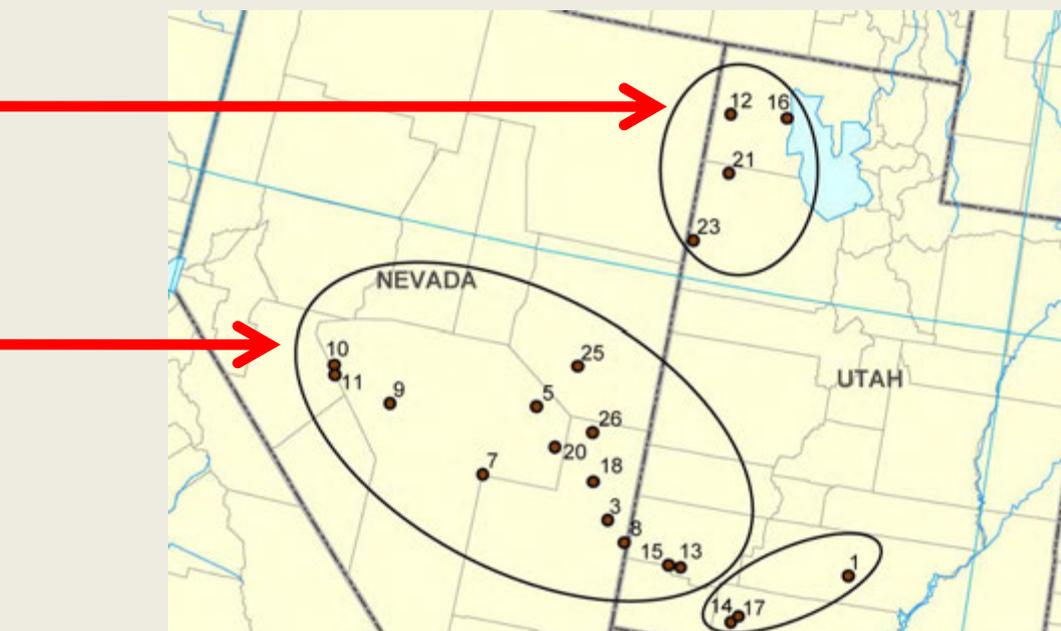




Release Strategy for Searls Prairie Clover

Northwestern Utah

**Southern
Great Basin**



**Colorado
Plateau**



Combining Genetic/Ecological and Performance Considerations

Genetics/Ecology:

- Genetic background
- Species compatibility

Field Performance:

- High seed production
- Vigorous seedlings
- Competitive ability

Plants that:

- Establish, compete, and persist
- Stabilize the site
- Have affordable, available seed



Partnering with Growers to Make Seed Available of Three Legume Species

1. Basalt Milkvetch (*Astragalus filipes*)



2. Western Prairie Clover (*Dalea ornata*)



3. Searls Prairie Clover (*Dalea searlsiae*)



Grower partners: BFI Native Seeds, L&H Seed, Southwest Seed, Allied Seed, NRCS-Aberdeen & Meeker, Ron Bitner/Paul Beckman, Jerry Erstrom



Greenhouse Seedling Emergence Study

Problem: Hard seed (physical and/or physiological)

- Limits initial, uniform germination
- Germination during long time period



**Species: Basalt milkvetch, western prairie clover,
Searls prairie clover, Utah sweetvetch (check)**

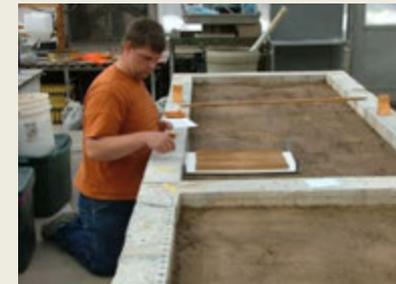
Seed Treatments: None, acid-scarified, sandpaper-scarified

Seeding Depth: 0.6 cm (1/4 inch), 1.9 cm (3/4 inch)

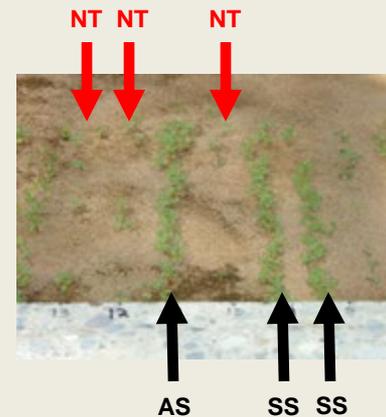
Seed Age: Current-year seed, two-year-old seed



Preliminary Results



Day
10



Day
27

- Scarification greatly improved germination in *Dalea*, less so for *A. filipes*.
- Seedlings of *Dalea* emerged well at $\frac{3}{4}$ -inch depth.



Other Studies With These Species

Field Seedling Establishment

Shaun Bushman

Doug Johnson

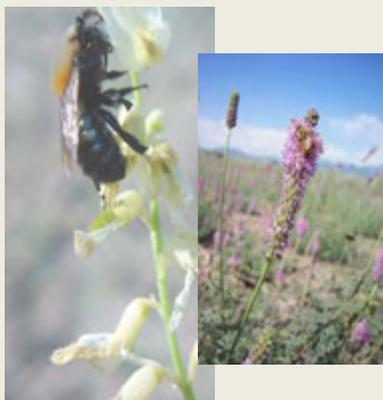


Pollination

Seed Predation

Herbicide Effects

Jim Cane



Corey Ransom

Clint Shock





Acknowledgements

Great Basin Native Plant Selection and Increase Project





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PLANTS FOR THE WEST