

North American Legumes for Rangeland Restoration, Conservation, and Forage Production in the Western U.S.

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Need for Native Legume Species

Important for:

- Increased biodiversity
- Nitrogen fixation
- Forage for wildlife,
livestock, and birds



Basalt Milkvetch - *Astragalus filipes*



- * Wide spread
- * Upright habit

- * Good seed production
- * No toxicity

Western Prairie Clover

Dalea ornata



- * Northern GB
- * Upright habit

- * Good seed production
- * No toxicity

Searls' Prairie Clover

Dalea searlsiae



- * Southern GB
- * Upright habit



- * Good seed production
- * No toxicity

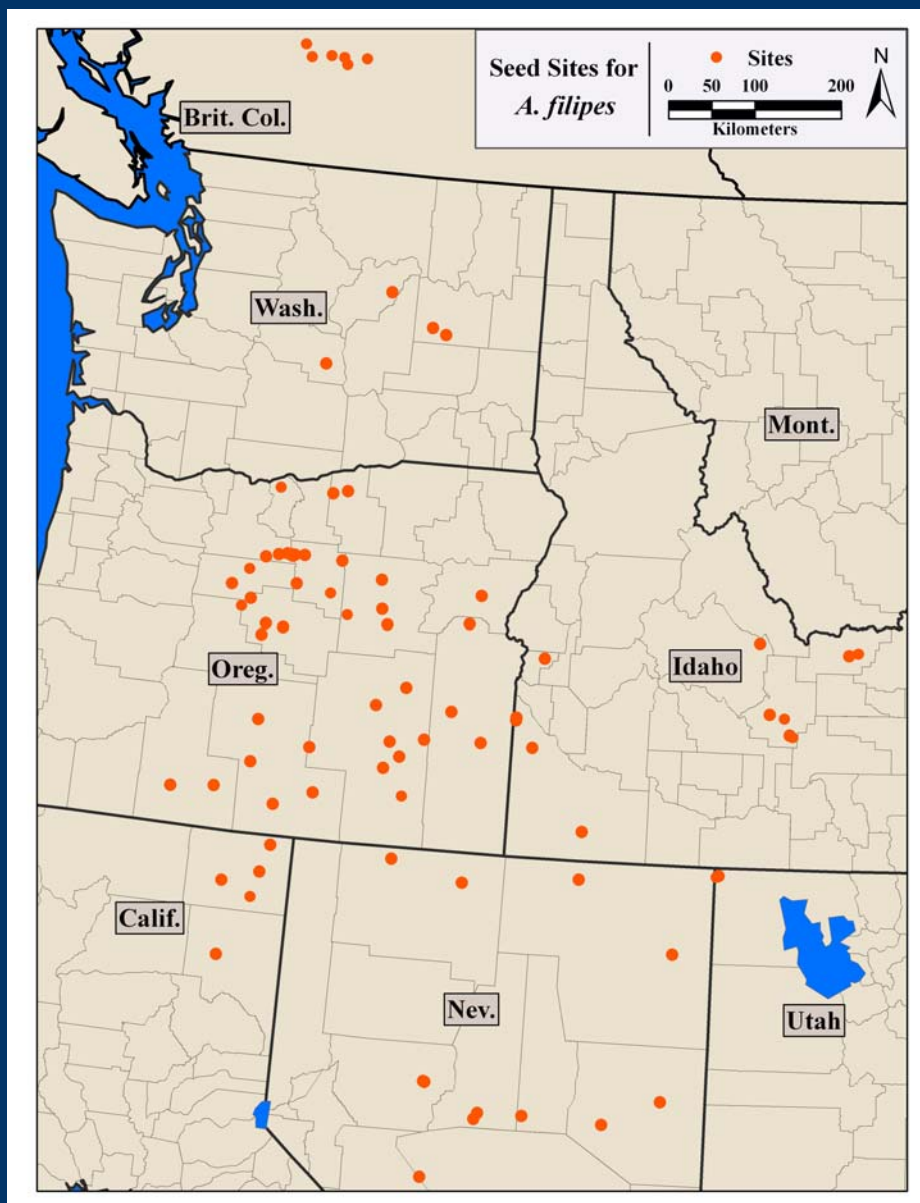
Study Objective

Evaluate seed collections of three North American legume species for their plant characteristics and genetic diversity for eventual plant releases



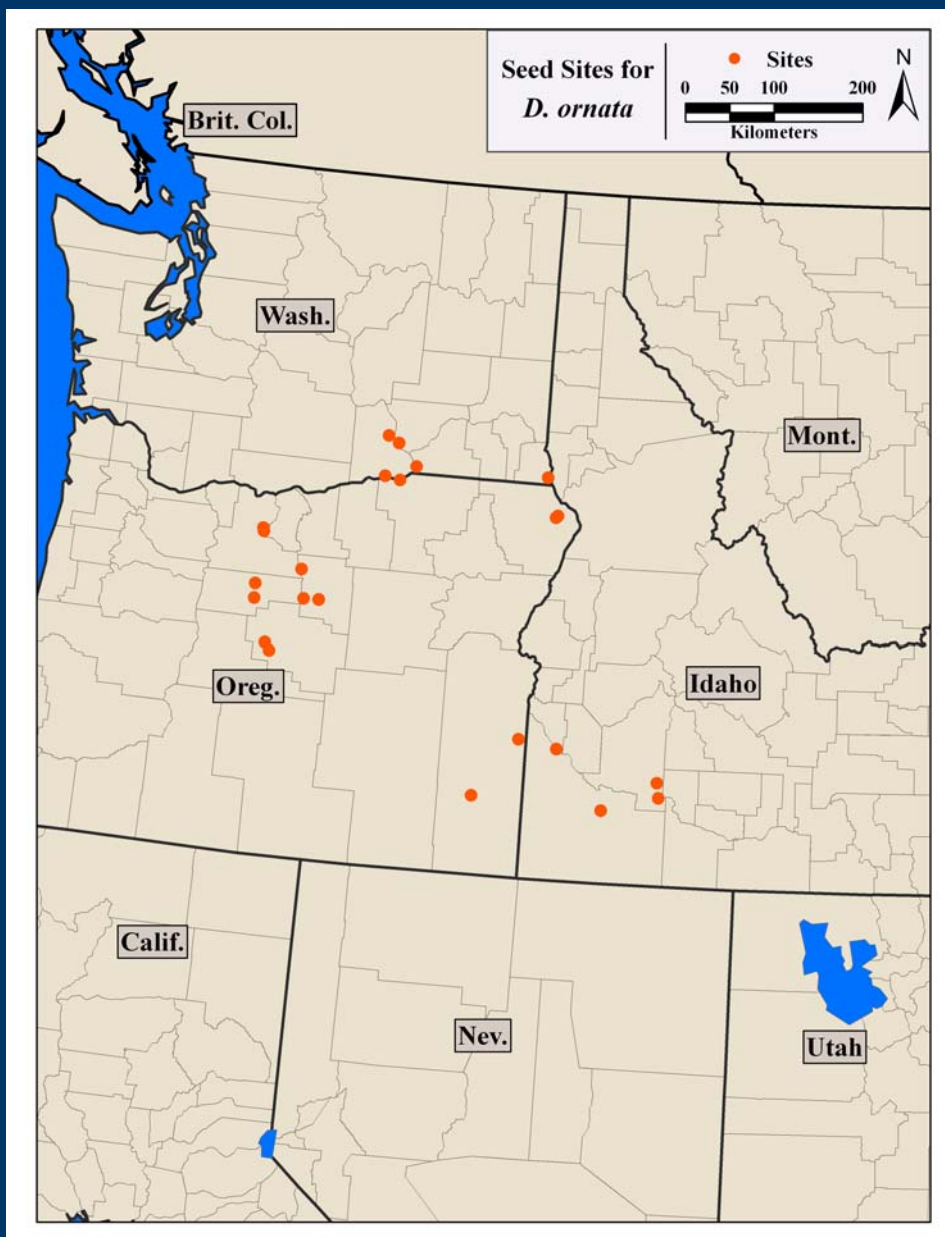
Basalt Milkvetch Collections (2003-205)

85 sites



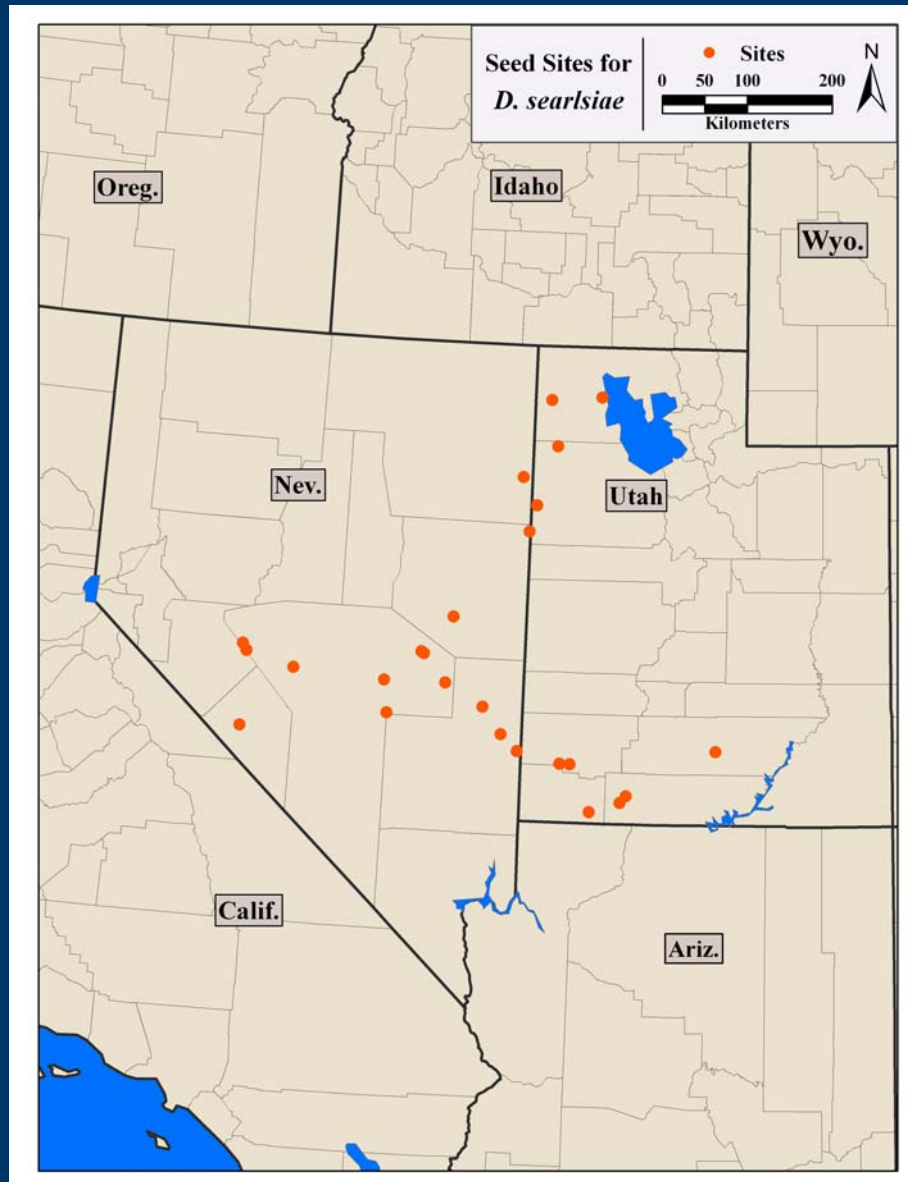
Western Prairie Clover Collections (2004-05)

25 sites



Searls' Prairie Clover Collections (2005)

25 sites



Common Garden Study (Basalt Milkvetch)

Location: Evans Farm (near Logan, UT)

- Grew seedlings for 5 months in greenhouse
- Transplanted plants to field (May 2004)
- Allowed one year for establishment
- Data collection in 2005 and 2006



Common Garden Study Design

- Randomized complete block
- 67 collections
- 6 replications
- 5 plants per plot (0.5-m spacing)



Common Garden Field Data Collection (Basalt Milkvetch)

May, June (2005, 2006)

- * Number of stems
- * Number of flowers
- * Plant height
- * Plant vigor score (0-9)

June (2005, 2006)

- * Biomass harvest

October (2005, 2006)

- * Regrowth harvest



ANOVA Summary (Basalt Milkvetch)

Factor

Sign.

Number of stems

**

Number of flowers

**

Plant height

**

Plant vigor score

**

June biomass

**

October regrowth

**

Evaluation of Genetic Diversity in Basalt Milkvetch

- * 75 collections with 10 plants each
- * Each plant: 5 primer sets, 240 bands per set, ~1,200 total bands
- * Structure of genetic diversity



**Amplified
Fragment
Length
Polymorphisms**



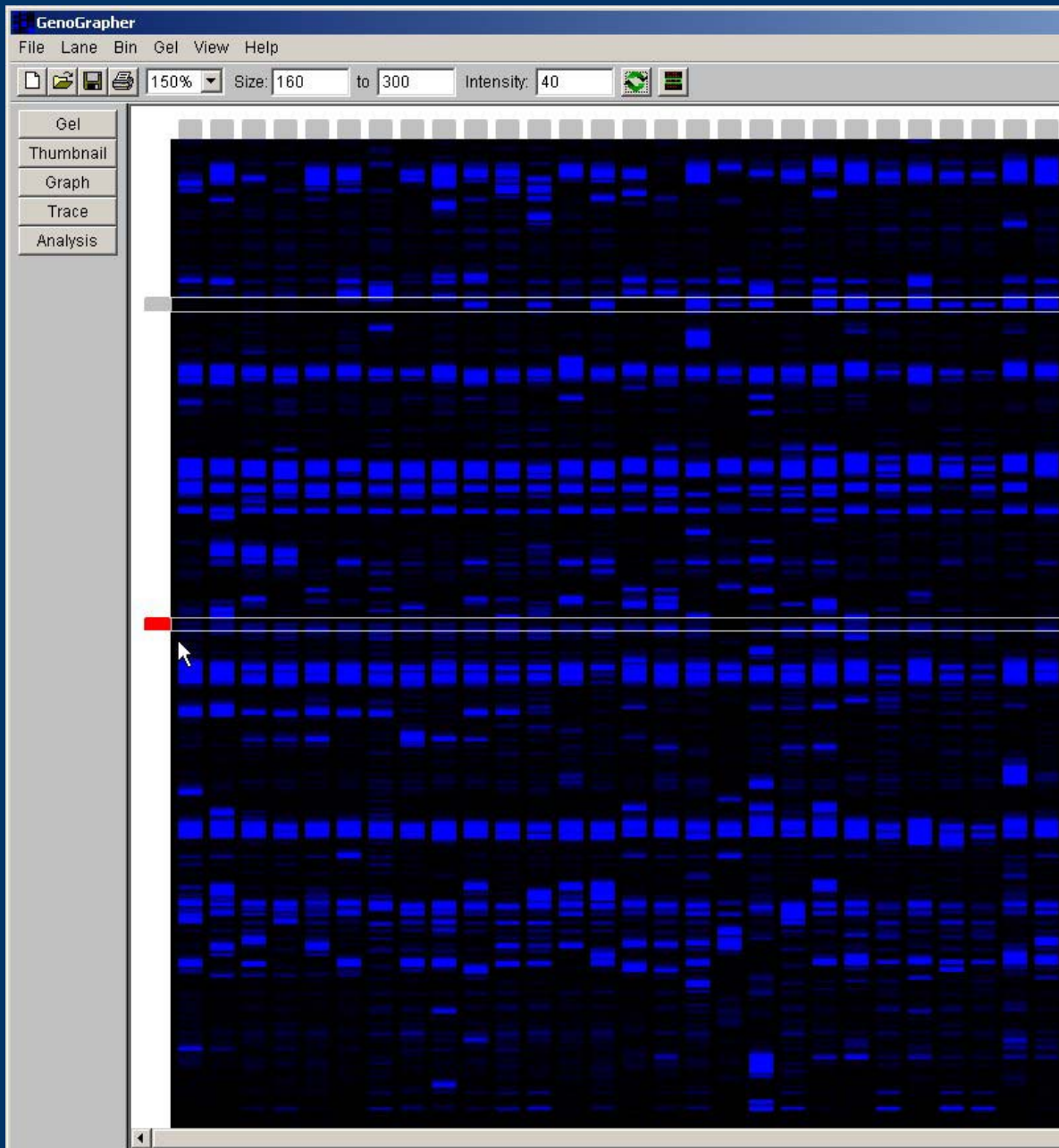
**Restriction enzymes digest
DNA into fragments.**



**Sequence “adaptors” are
attached to the fragment ends.**

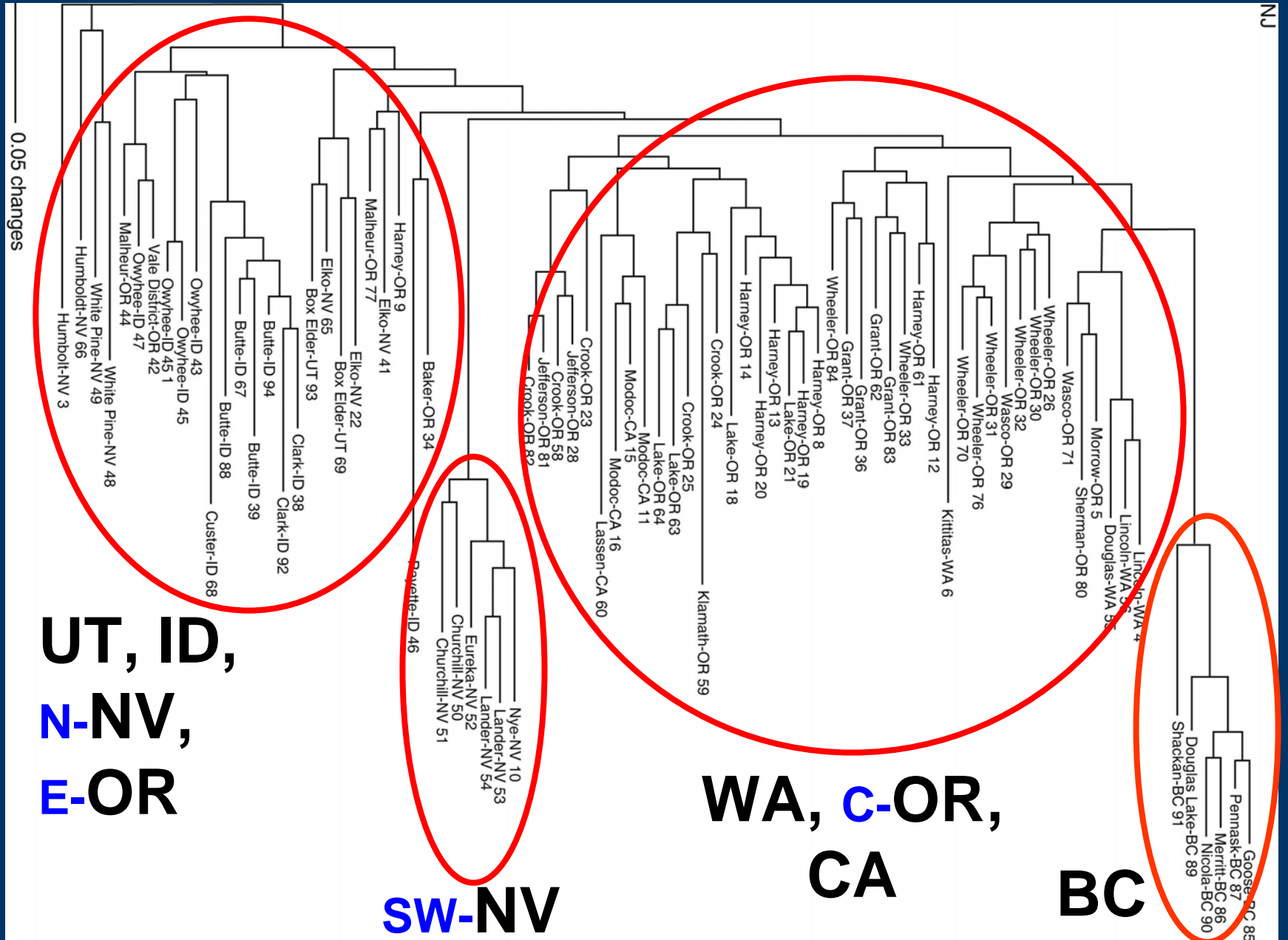
CTCGTAGACTGCGTACC ————— AATTGGTACGCAGTCTAC
GACGATGAGTCCTGAG ————— TACTCAGGACTCATC
CTCGTAGACTGCGTACC ————— TACTCAGGACTCATC
GACGATGAGTCCTGAG ————— AATTGGTACGCAGTCTAC

Primers are designed to bind to the adaptors, and they have extra nucleotides on their terminal ends to reduce the number of bands that are amplified.



AFLP data are recorded as the presence or absence of bands

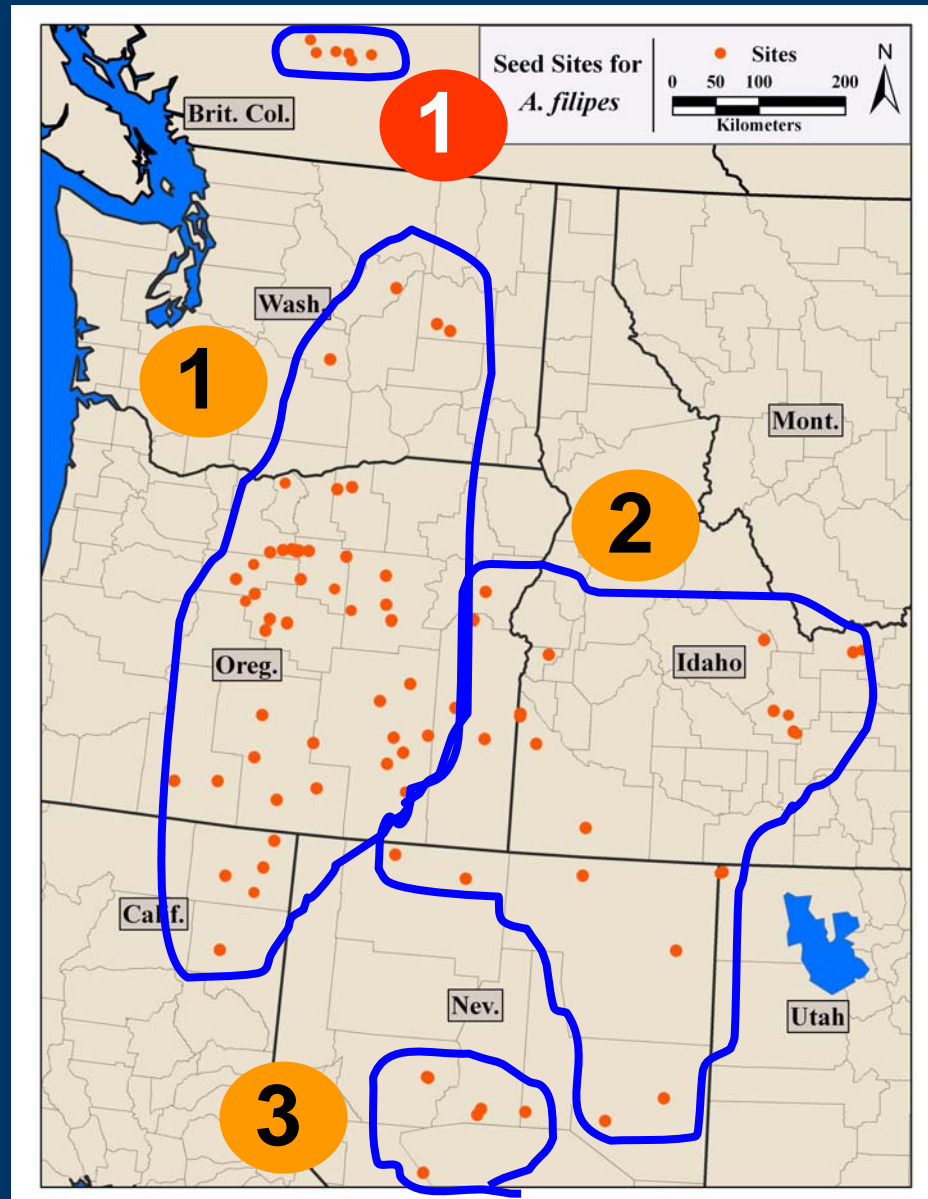
Genetic Distance Dendrogram (Basalt Milkvetch)



Preliminary Genetic Groupings (Basalt Milkvetch)

One Group for Canada

Three Groups for U.S.



Similar Work with Two Dalea Species

- Common garden field evaluations
- AFLP genetic diversity studies
- Rhizobium isolation studies
- Pollination, seed prod., weed mgmt.



Dalea ornata



Dalea searlsiae

Conclusions (Basalt Milkvetch)

- **Field studies showed that collections varied considerably in biomass production, regrowth, and morphology.**
- **AFLP studies indicated significant differences in genetic diversity, which can be used in defining the number of germplasm releases needed.**
- **These three native legumes are promising species for restoring degraded rangelands in the western U.S.A.**

Acknowledgements

Great Basin Native Plant Selection and Increase Project

