

# SEED TRANSFER ZONES

What They Are, Why We Use Them,  
and Next Steps

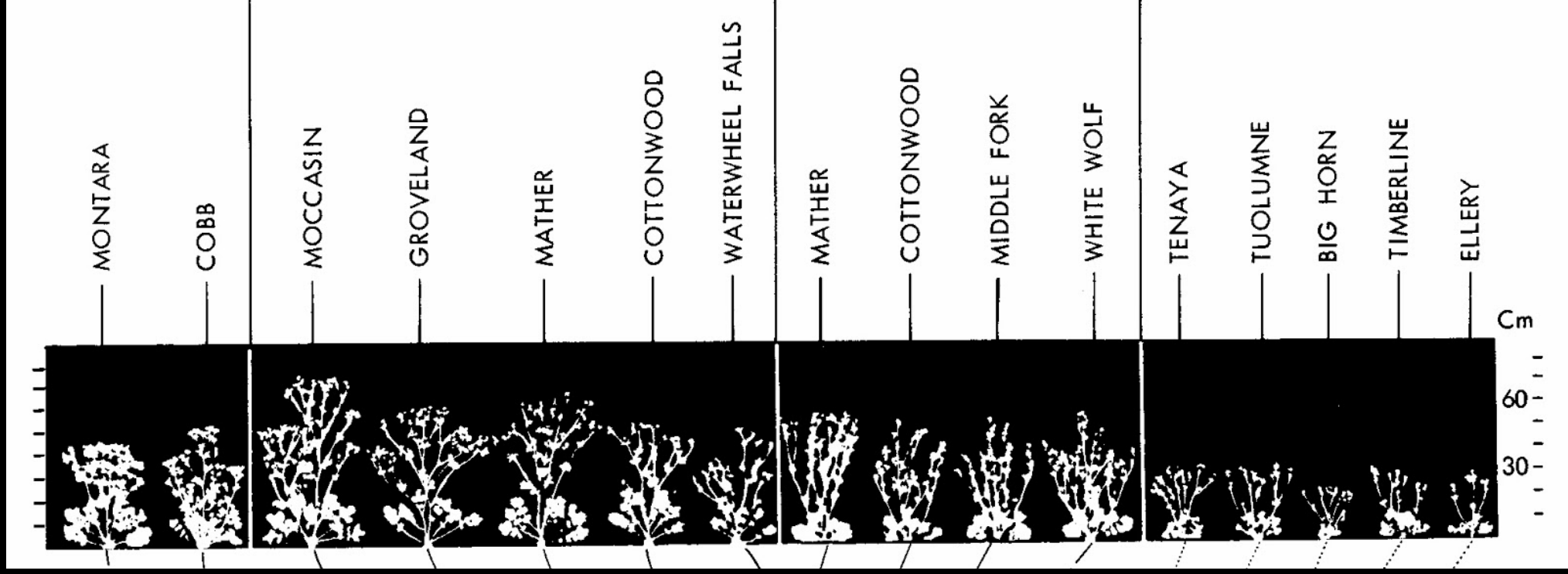


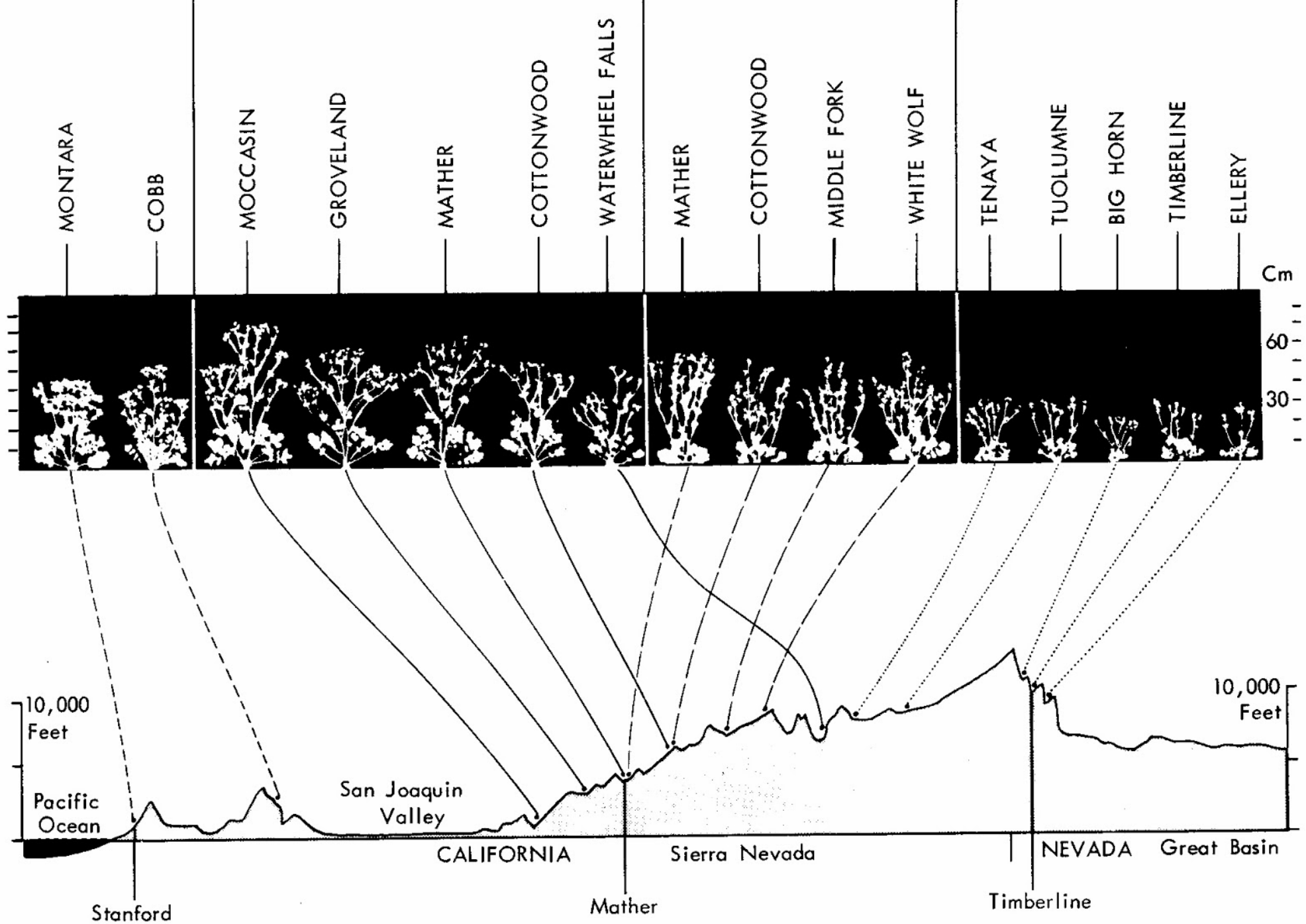
W.A. FRANKE COLLEGE OF  
**FORESTRY &  
CONSERVATION**  
UNIVERSITY OF MONTANA







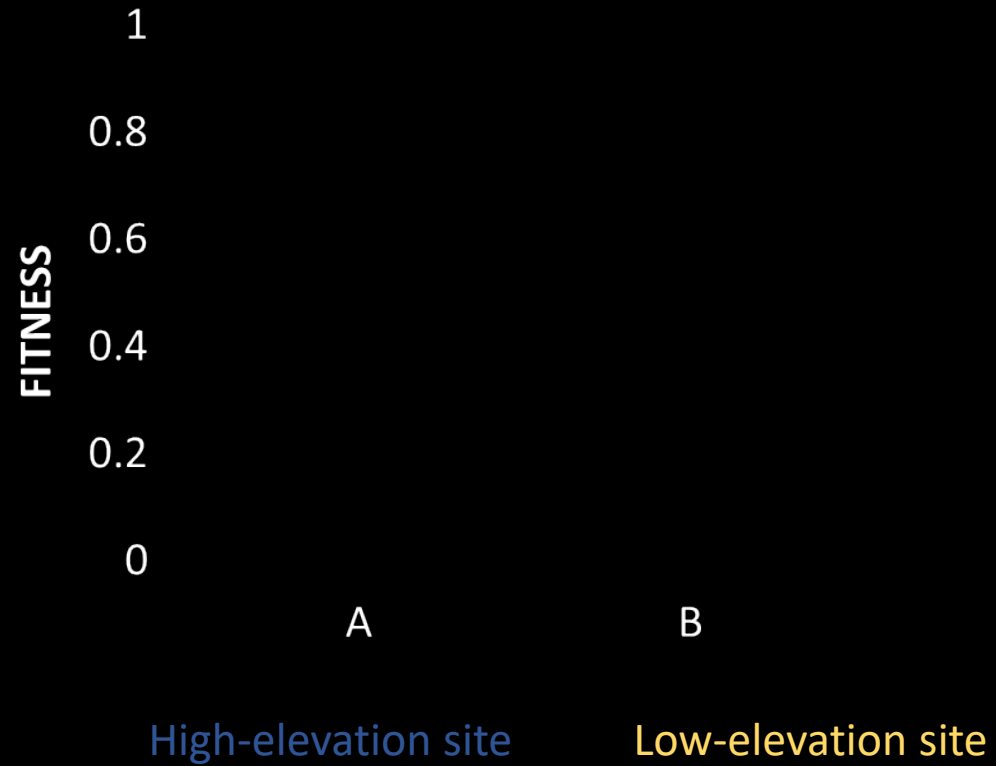




Based on work by Clausen



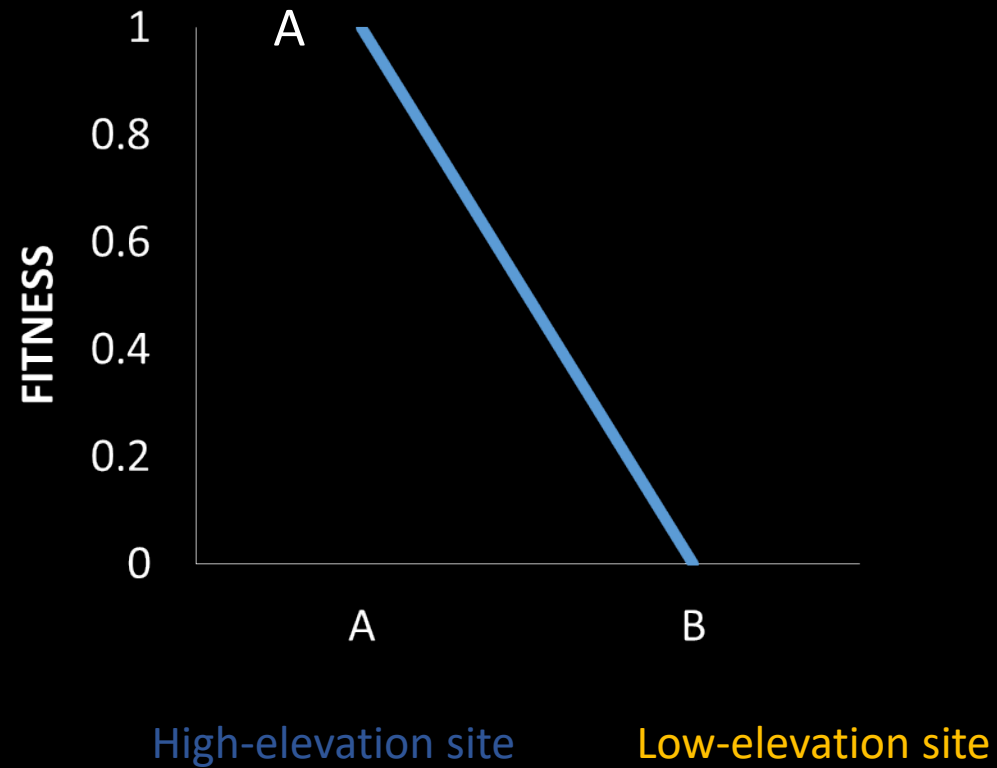
# Local Adaptation





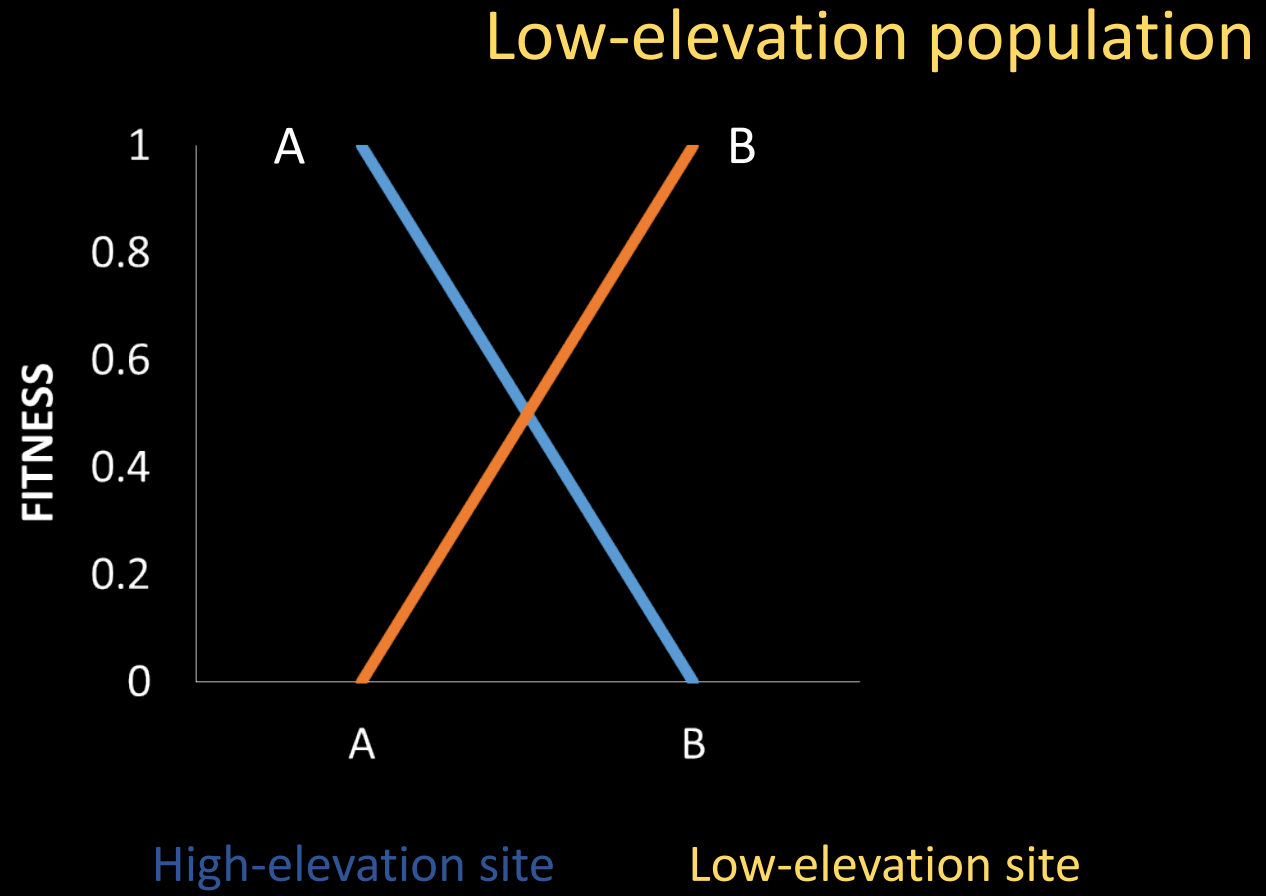
# Local Adaptation

High-elevation population

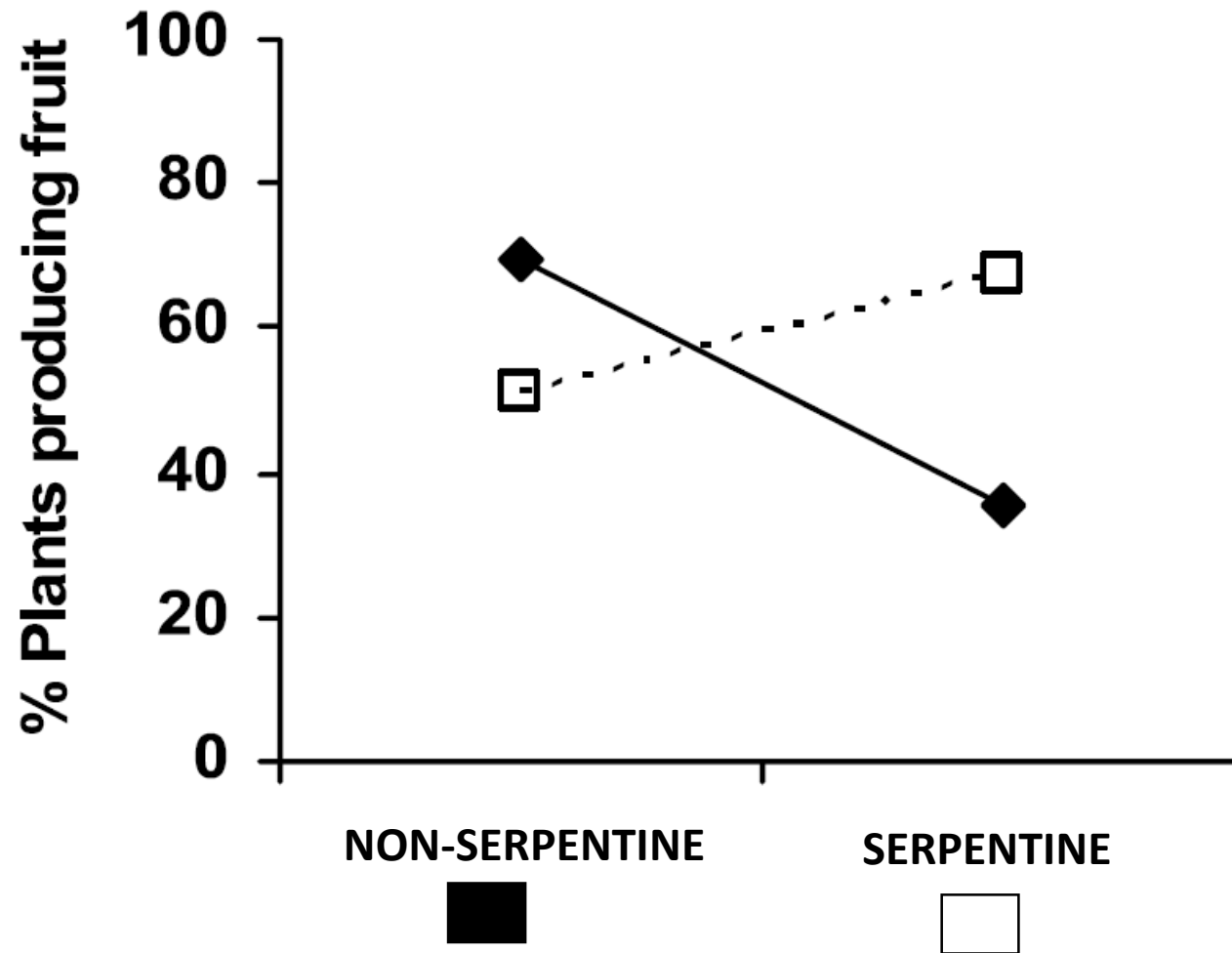




# Local Adaptation







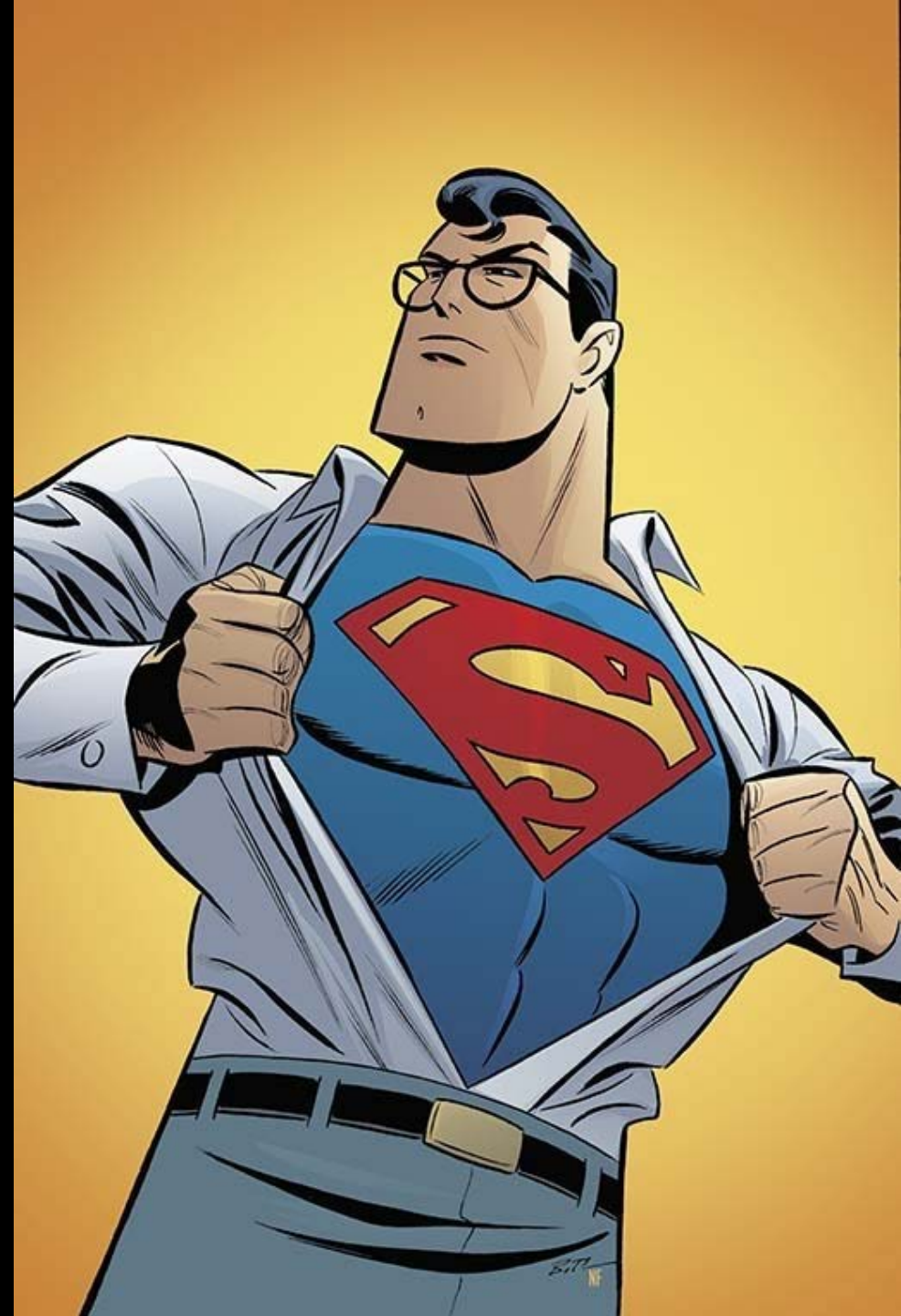
Wright, Stanton, Scherson 2006





# LOCAL ADAPTATION

- Higher fitness!
- Higher germination rate
- Higher survival
- More seeds
- Larger populations



# HOW LOCAL IS LOCAL?

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A detailed map of Montana is shown, divided into numerous seed transfer zones. Each zone is a specific geographic area, often following river valleys or mountain ranges, and is labeled with a unique alphanumeric code (e.g., 41a, 42q, 43n, 17x, 17p, 17aj, 17al, 17w, 17ak, 17h, 17am, 17ag, 17ah, 17ab, 17z, 17y, 17g, 17i, 17j, 17k, 17l, 17m, 17n, 17o, 17p, 17q, 17r, 17s, 17t, 17u, 17v, 17w, 17x, 17y, 17z, 42o, 42p, 42q, 42r, 42s, 42t, 42u, 42v, 42w, 42x, 42y, 42z, 43a, 43b, 43c, 43d, 43e, 43f, 43g, 43h, 43i, 43j, 43k, 43l, 43m, 43n, 43o, 43p, 43q, 43r, 43s, 43t, 43u, 43v, 43w, 43x, 43y, 43z). The zones are color-coded: light yellow for the northernmost areas, dark brown for the central mountainous regions, and various shades of green and blue for the southern and western regions. Major rivers like the Yellowstone, Missouri, and Snake are shown in blue. Cities and towns are marked with small circles and labels. A large, semi-transparent dark grey banner with the text "SEED TRANSFER ZONES" in white, bold, sans-serif capital letters is centered across the middle of the map.

# SEED TRANSFER ZONES

# Pearly Everlasting (*Anaphalis margaritacea*) Seed Collection Sites



0 25 50 100 Miles











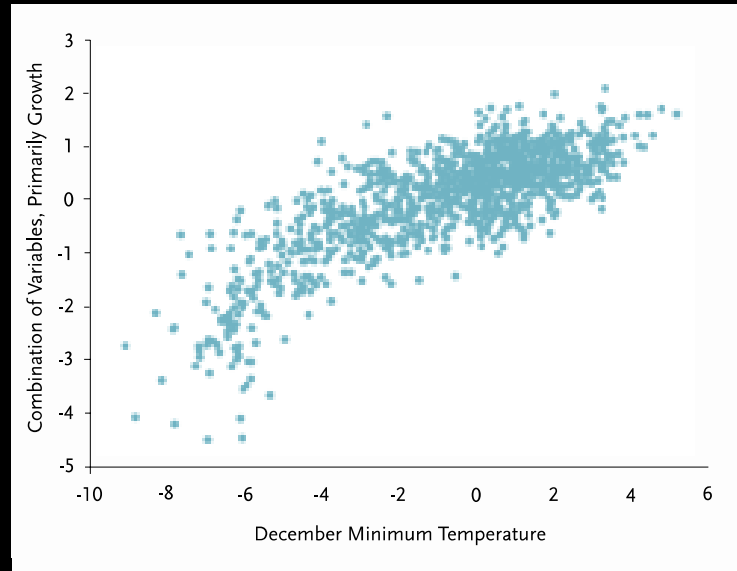
MEASURE  
\*ADAPTIVE\* TRAITS







MEASURE  
\*ADAPTIVE\* TRAITS

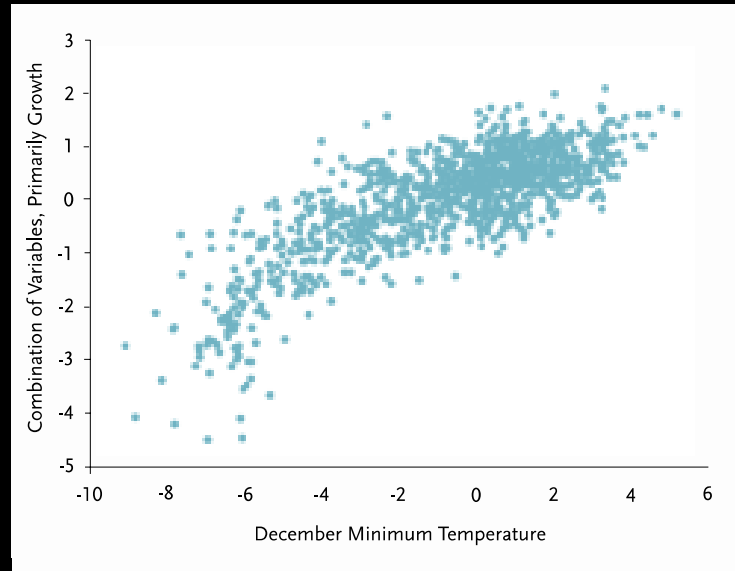


RELATIONSHIPS BETWEEN  
TRAITS AND  
ENVIRONMENT





MEASURE  
\*ADAPTIVE\* TRAITS



RELATIONSHIPS BETWEEN  
TRAITS AND  
ENVIRONMENT



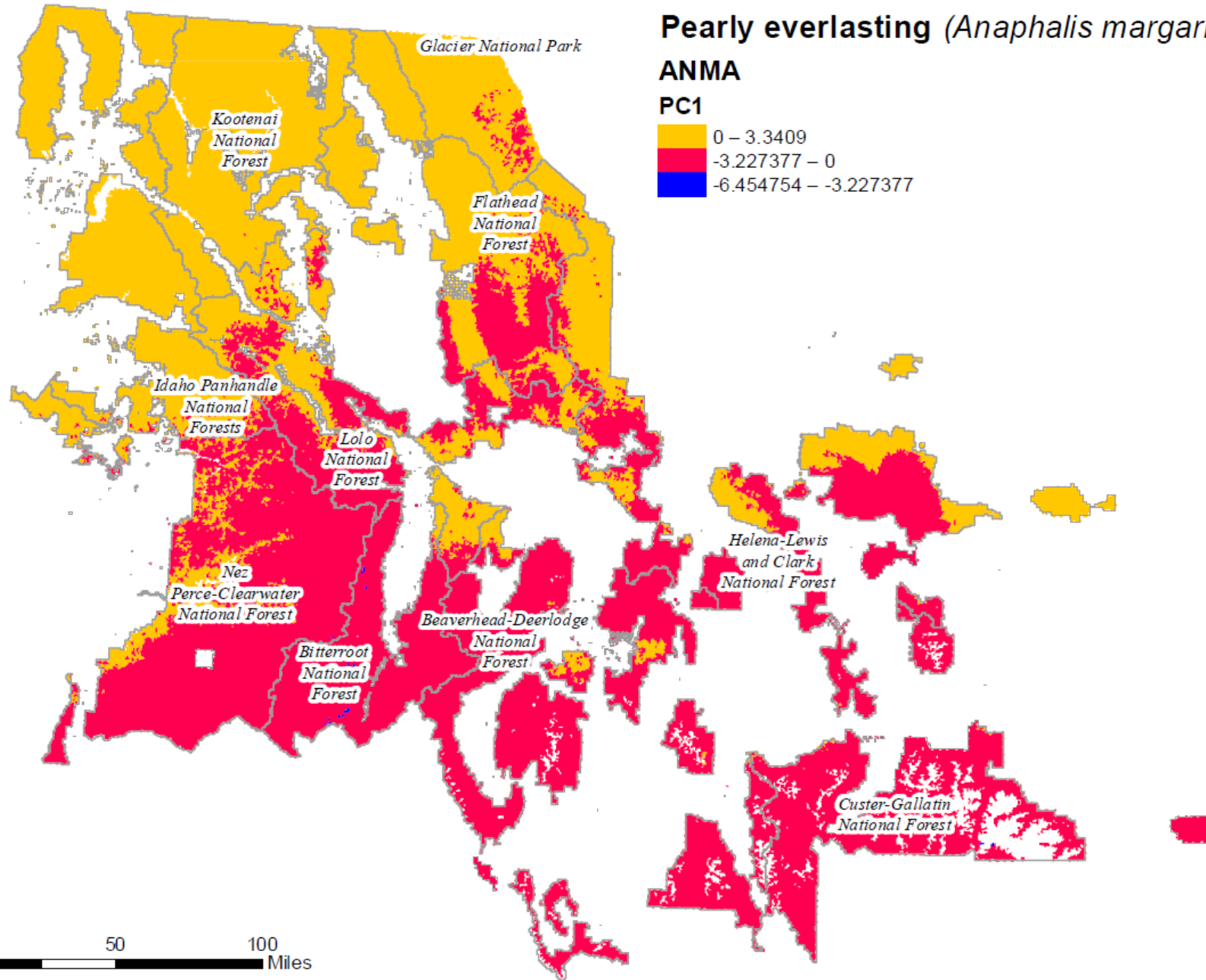
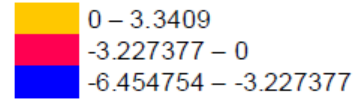
MAP RELATIONSHIP  
ON LANDSCAPE



# Pearly everlasting (*Anaphalis margaritacea*)

ANMA

PC1

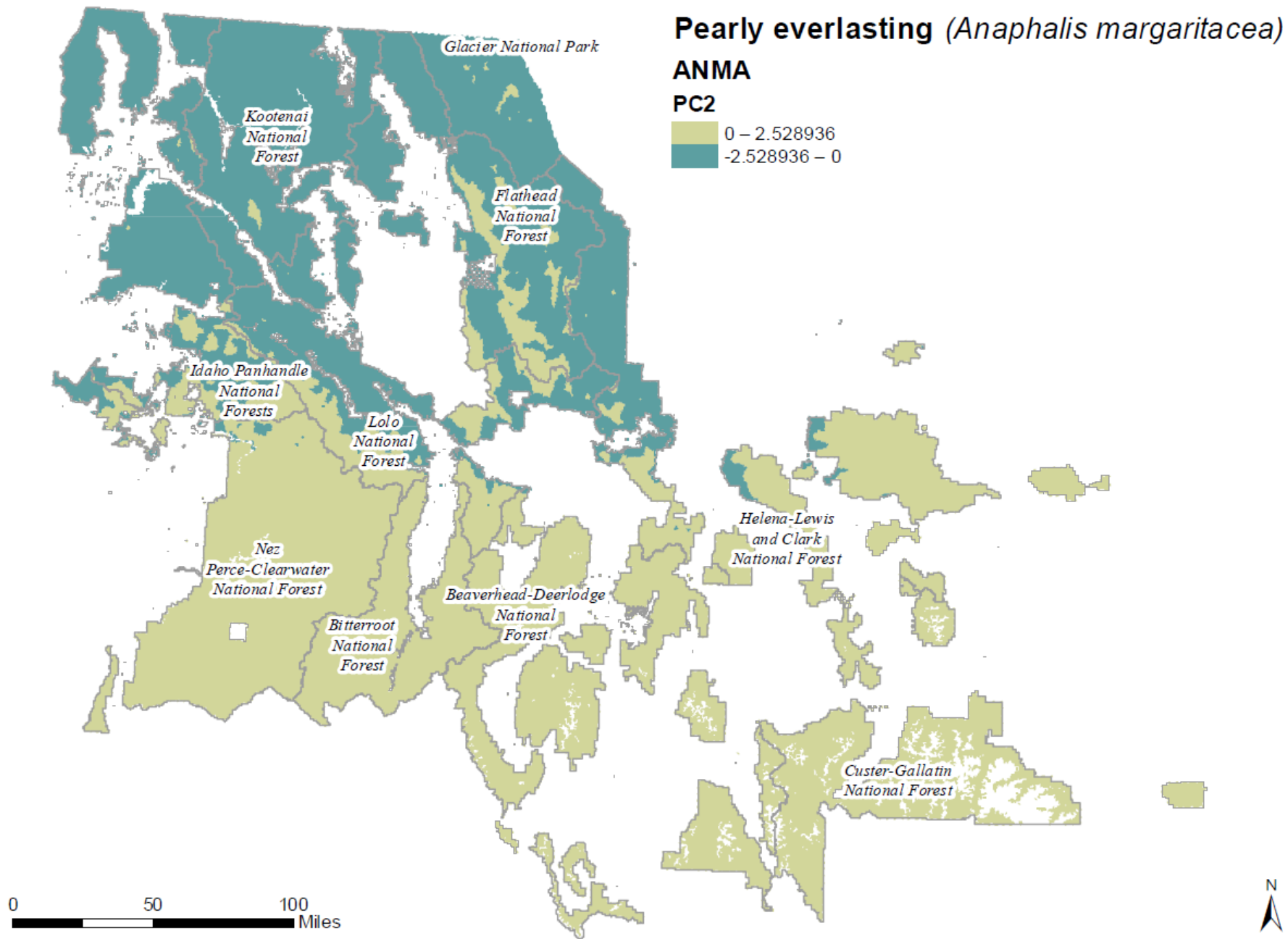


Plant size

Growing season

Latitude

Precipitation



**Survival**  
**Growth form**

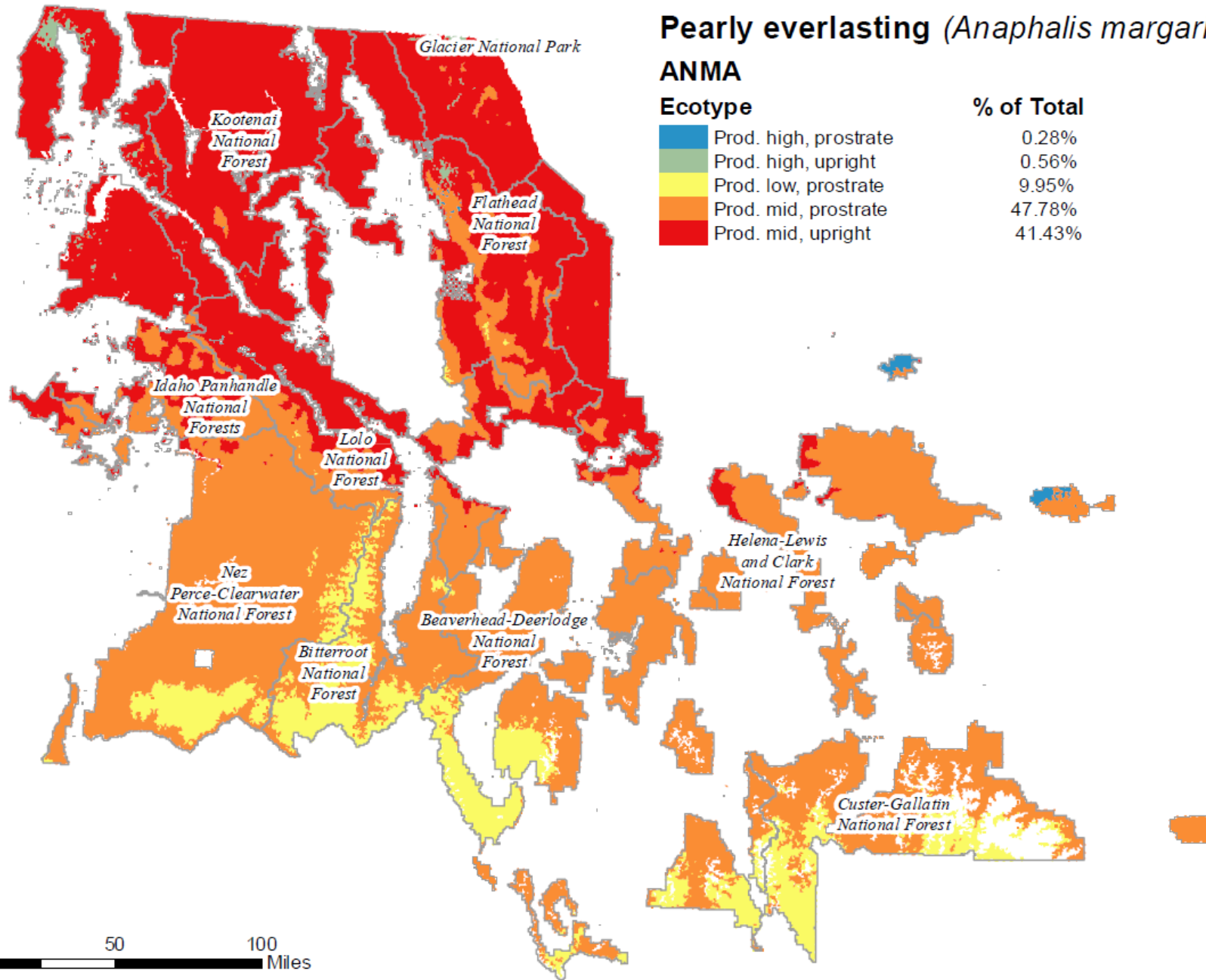
Latitude  
Precipitation

## Pearly everlasting (*Anaphalis margaritacea*)

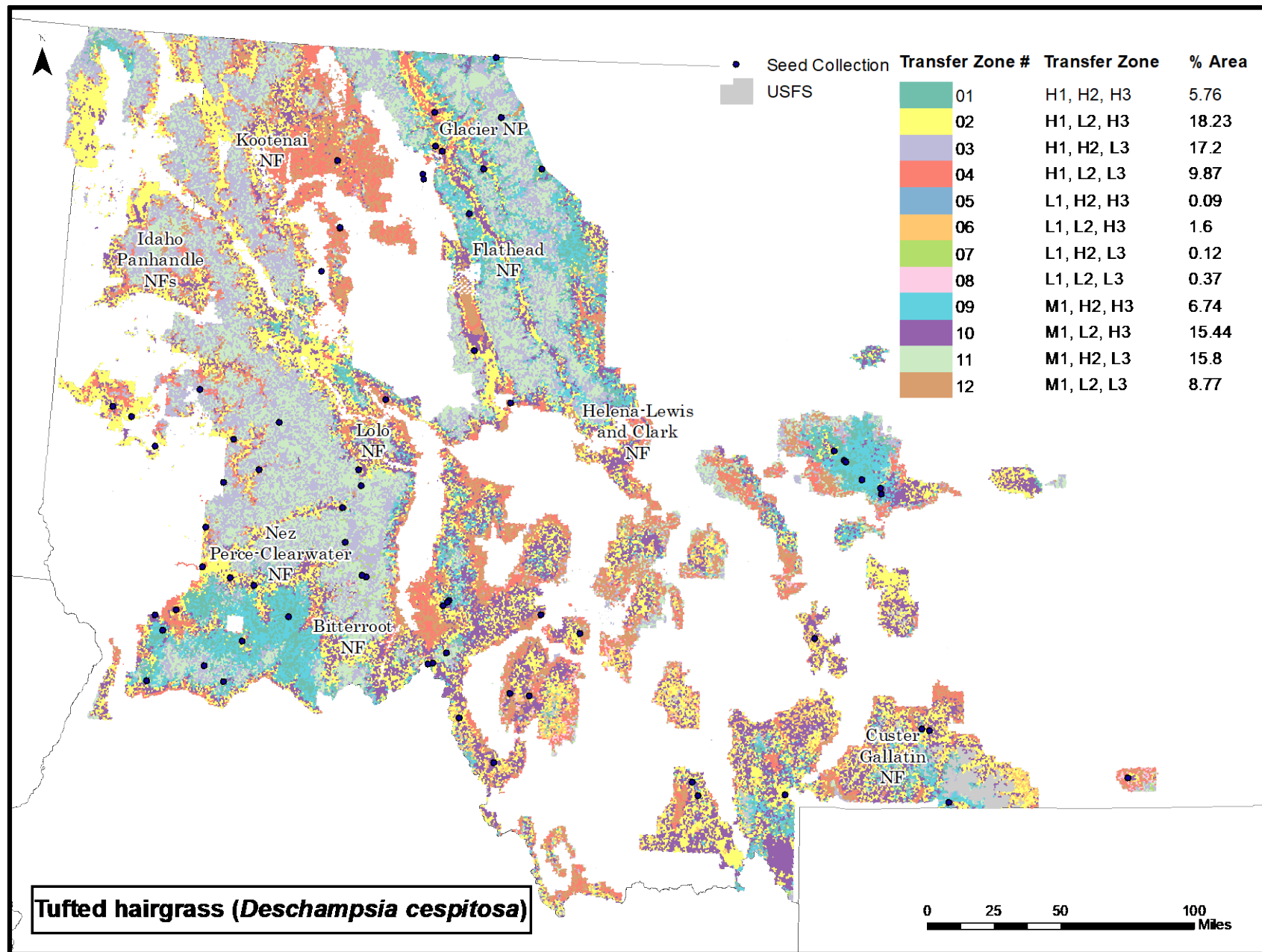
### ANMA

#### Ecotype

Ecotype	% of Total
Prod. high, prostrate	0.28%
Prod. high, upright	0.56%
Prod. low, prostrate	9.95%
Prod. mid, prostrate	47.78%
Prod. mid, upright	41.43%











**NOW WHAT?**



# Raining on the Climate Parade

- Soils
  - Water availability, nutrients, pH, minerals



# Raining on the Climate Parade

- Soils
  - Water availability, nutrients, pH, minerals
  - Extreme and moderate differences





# Raining on the Climate Parade

- Soils

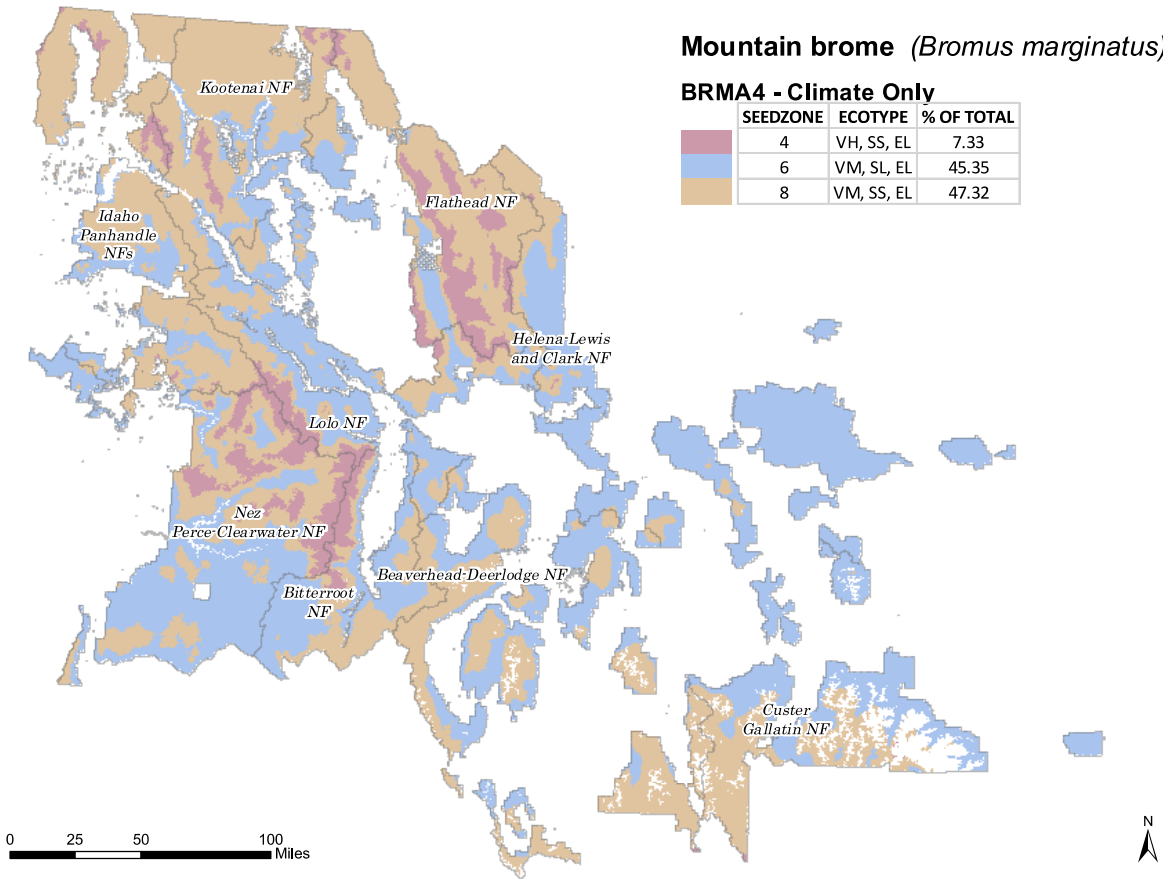
- Water availability, nutrients, pH, minerals
- Extreme and moderate differences
- Data quantity and quality



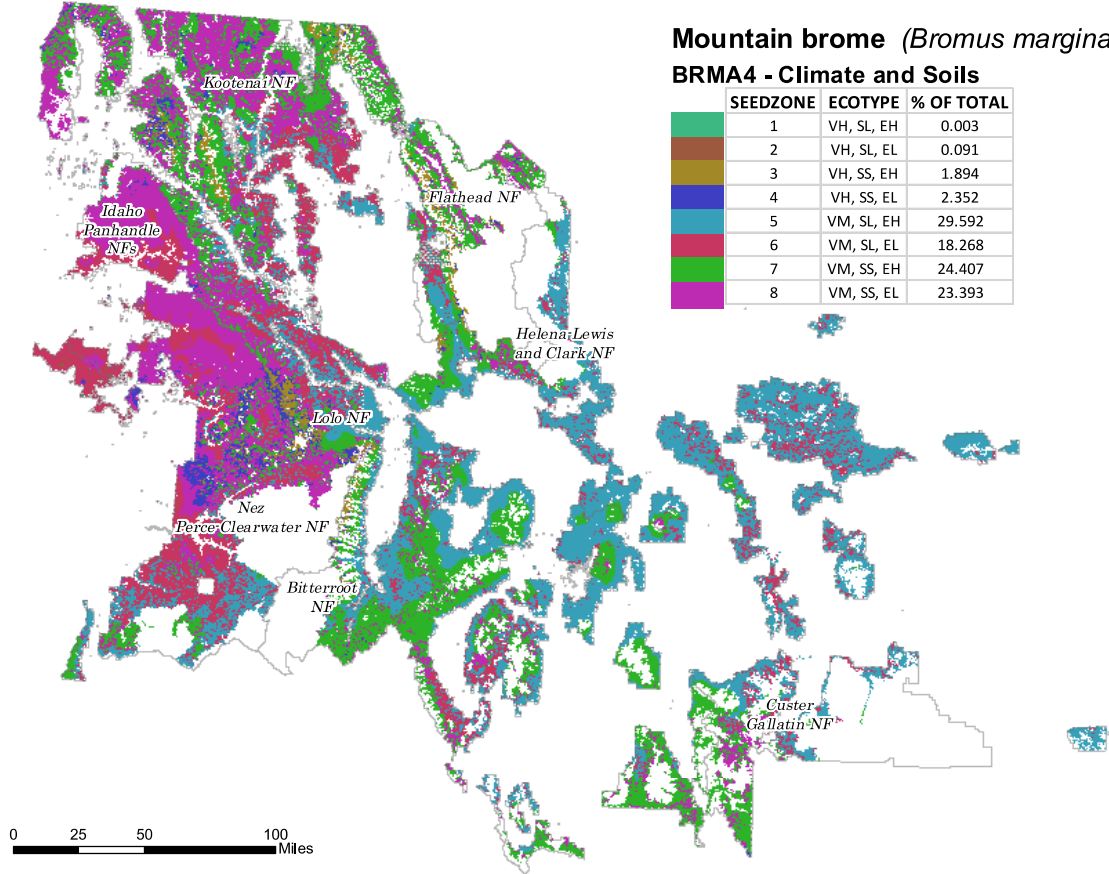
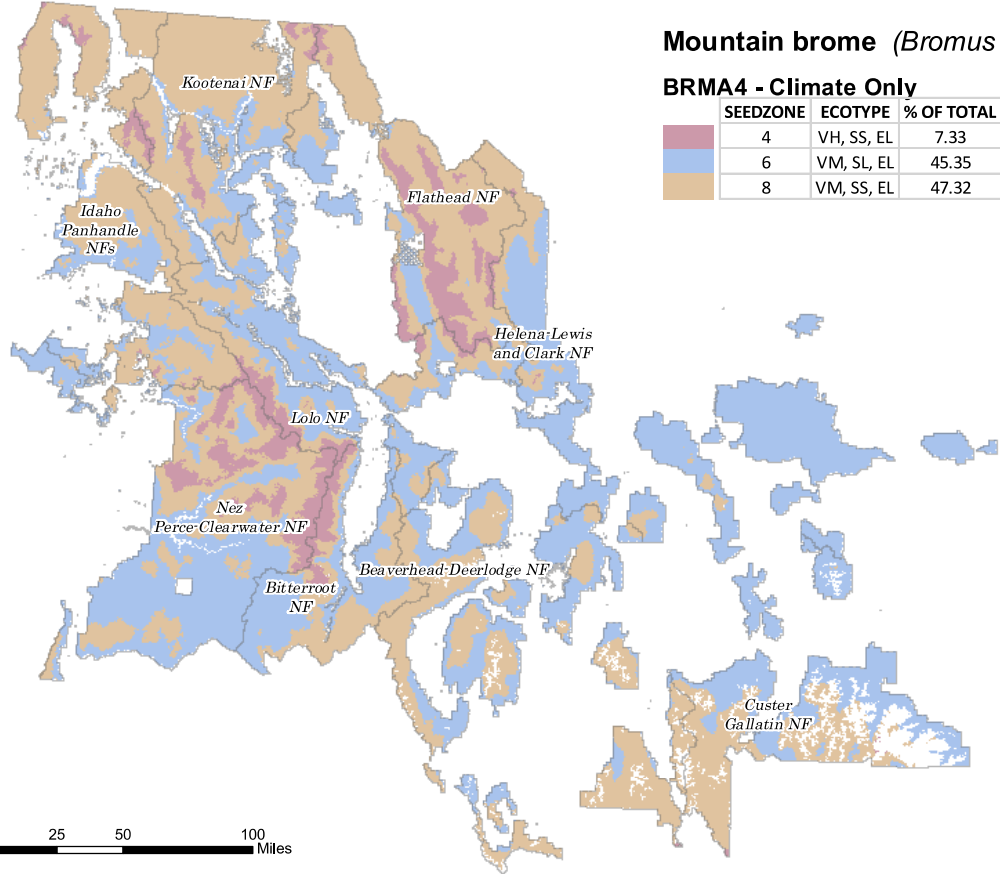
Mountain brome (*Bromus marginatus*)

BRMA4 - Climate Only

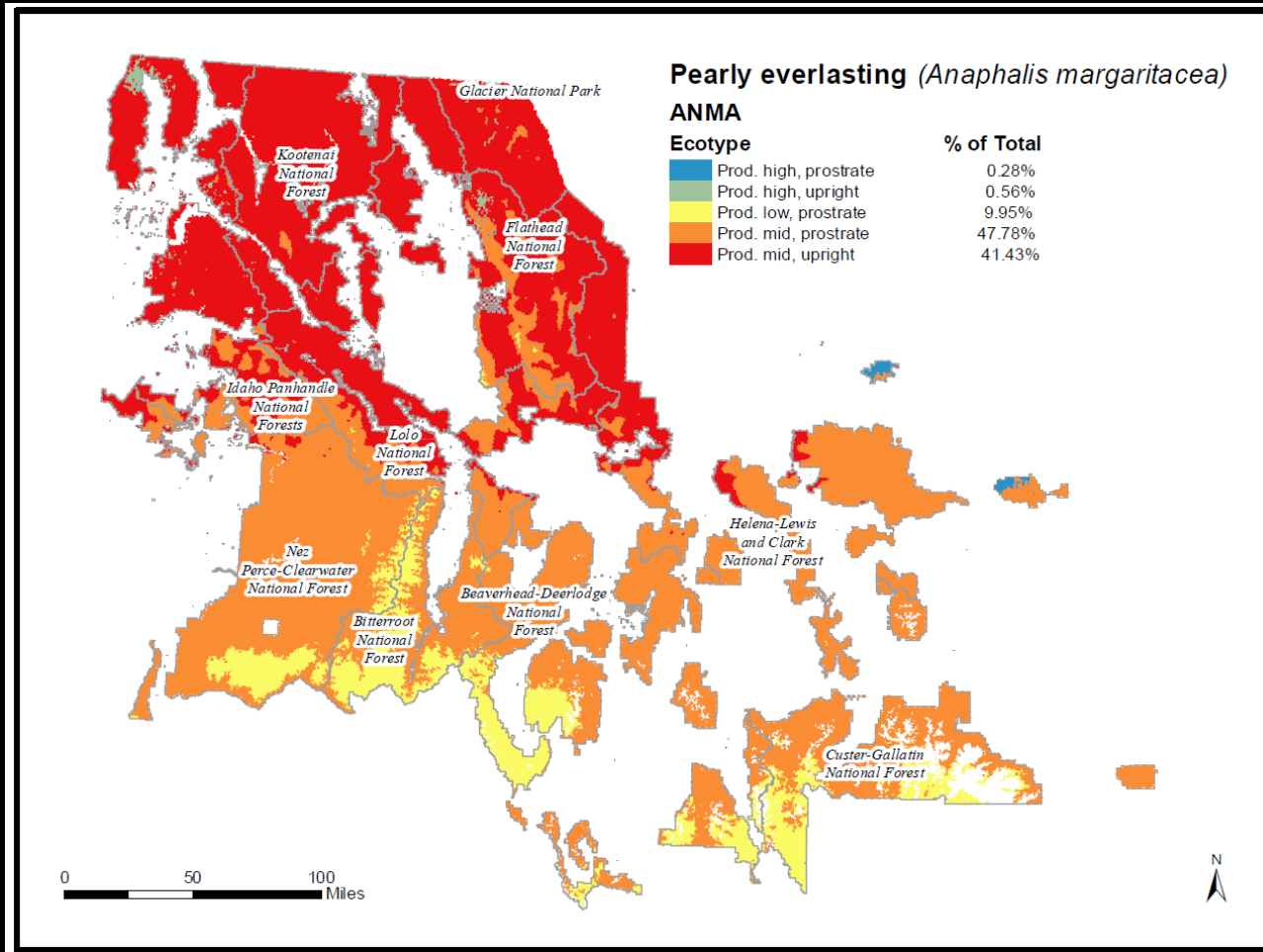
SEEDZONE	ECOTYPE	% OF TOTAL
4	VH, SS, EL	7.33
6	VM, SL, EL	45.35
8	VM, SS, EL	47.32







# Testing Maps



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Fitness  
differences?





*“Make it look like natural selection.”*