Invasion of scablands by *Ventenata dubia*

Is it too late?

Scablands

- Lithosols-very shallow soils overlie impervious non-fractured basalt bedrock. (4-10 inches)
- Occur throughout the Blue and Ochoco mtns. (3800-7000 ft) flat, or gentle slopes
- Frost heaving creates accumulation surface rock (gravel), bare ground (ave. 63%) typically 80%.
- Sparsely vegetated with stiff sagebrush, low sage, perennial bunchgrasses, bitteroot, and a biocrust composed of mosses and lichens

Rare Plant habitat

Rare Plants of scablands

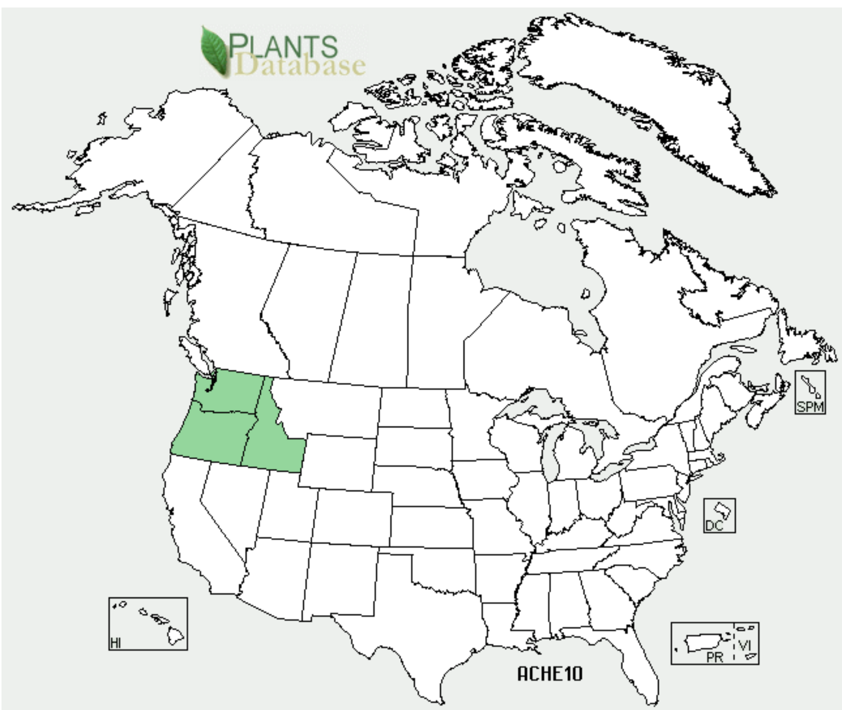
Henderson’s needlegrass

Wallowa needlegrass

Ochoco lomatium

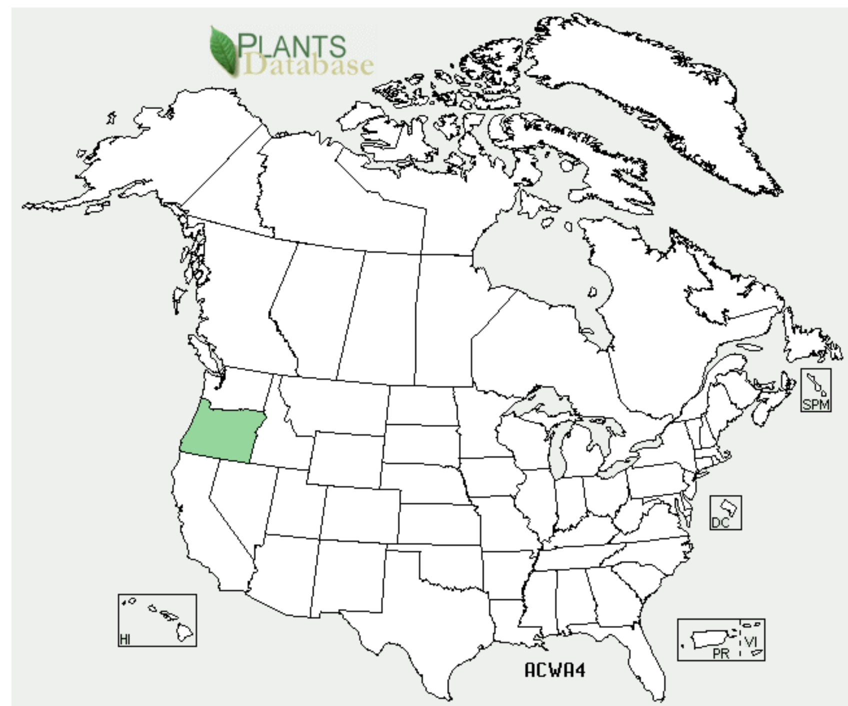
Rare plant distribution

Achnatherum hendersonii



Achnatherum wallowaensis

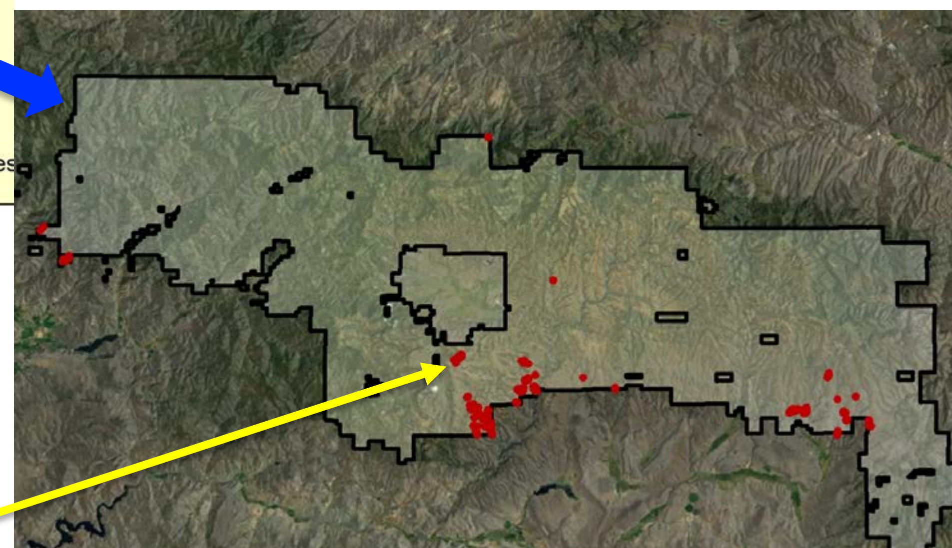
(crook and wallowa co.)




Achnatherum hendersonii

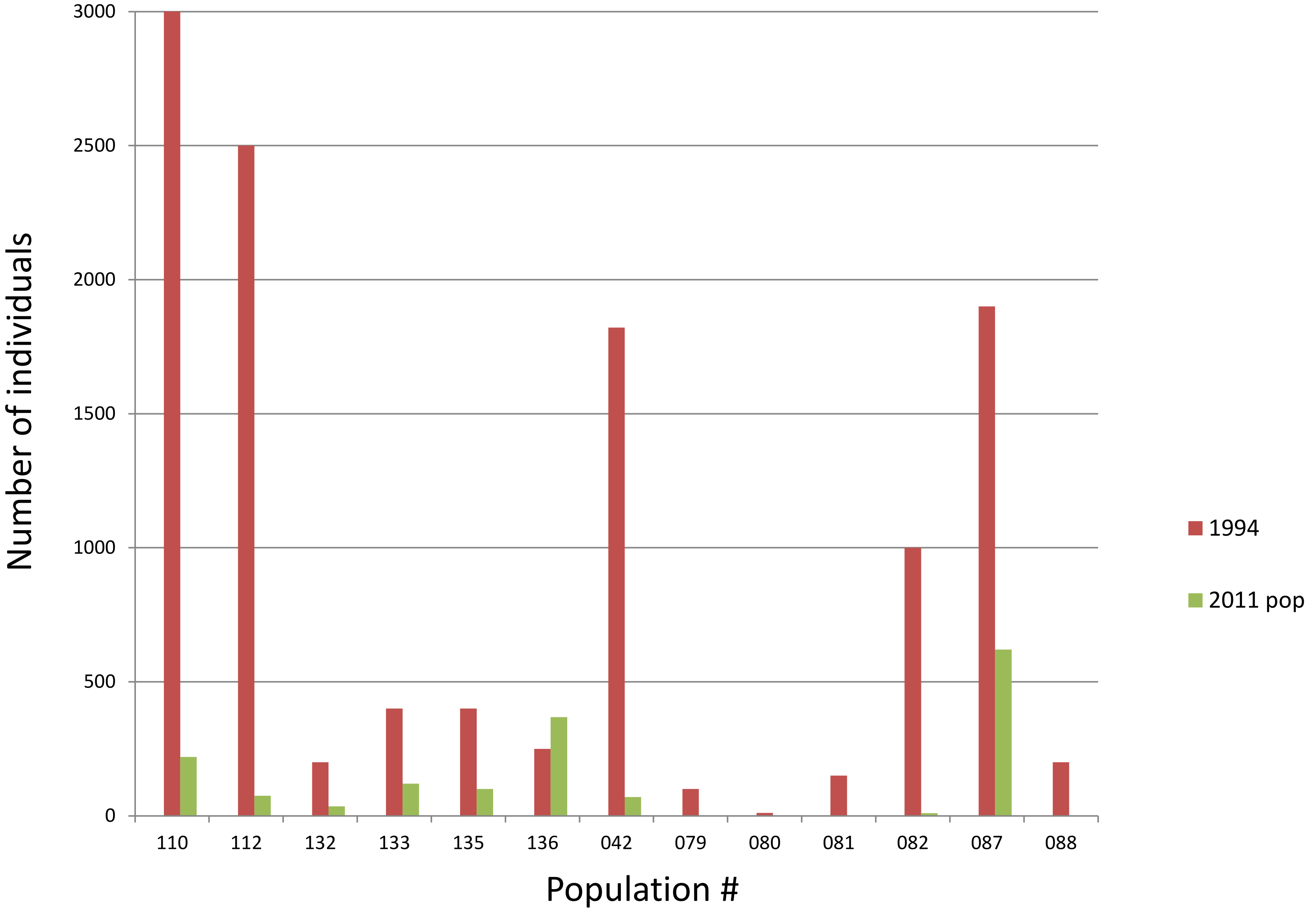
Study area

- Ochoco National Forest scablands
- Small areas (0.1-2acres)
- 39 populations of ACHE on the Ochocos

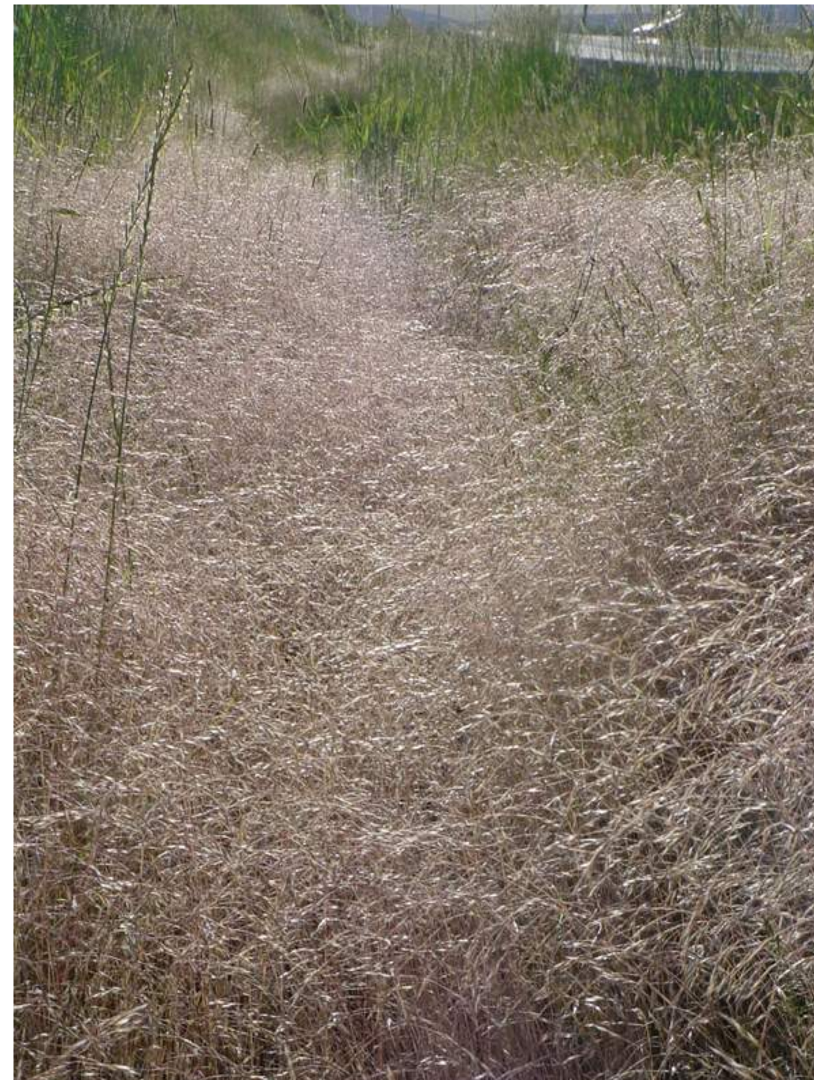


Scablands with Henderson’s needlegrass

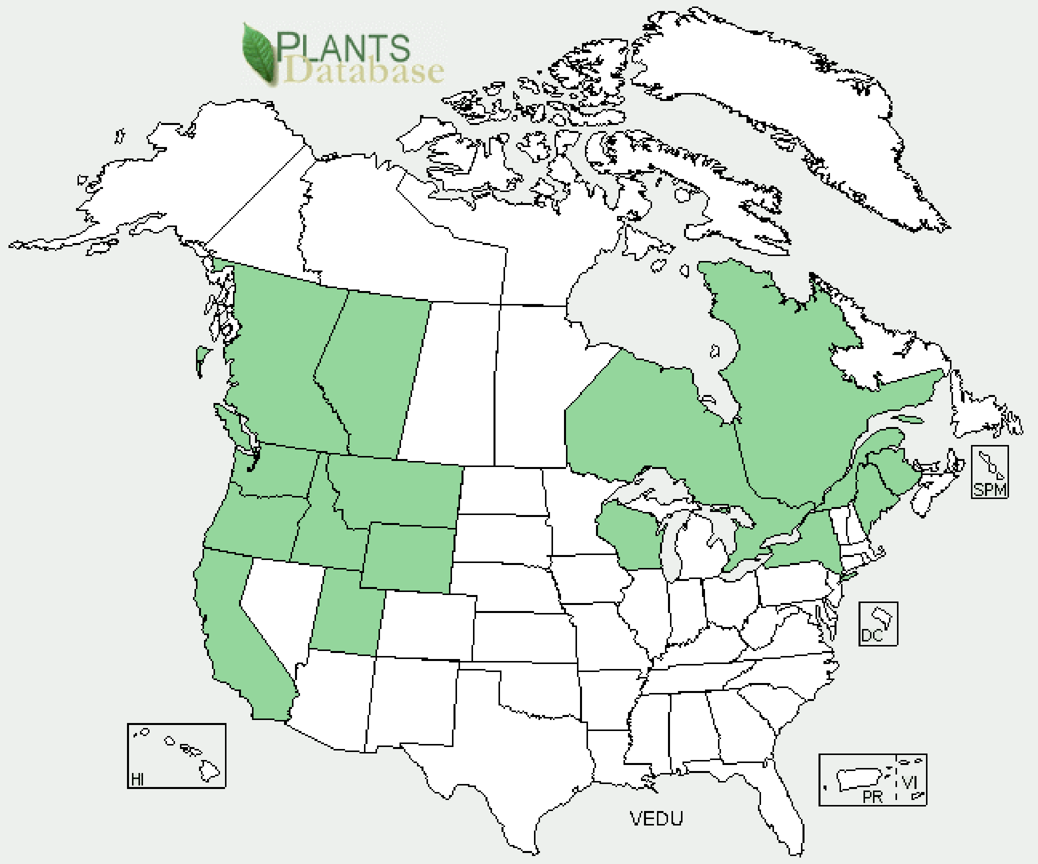
Henderson's Needlegrass Population decline



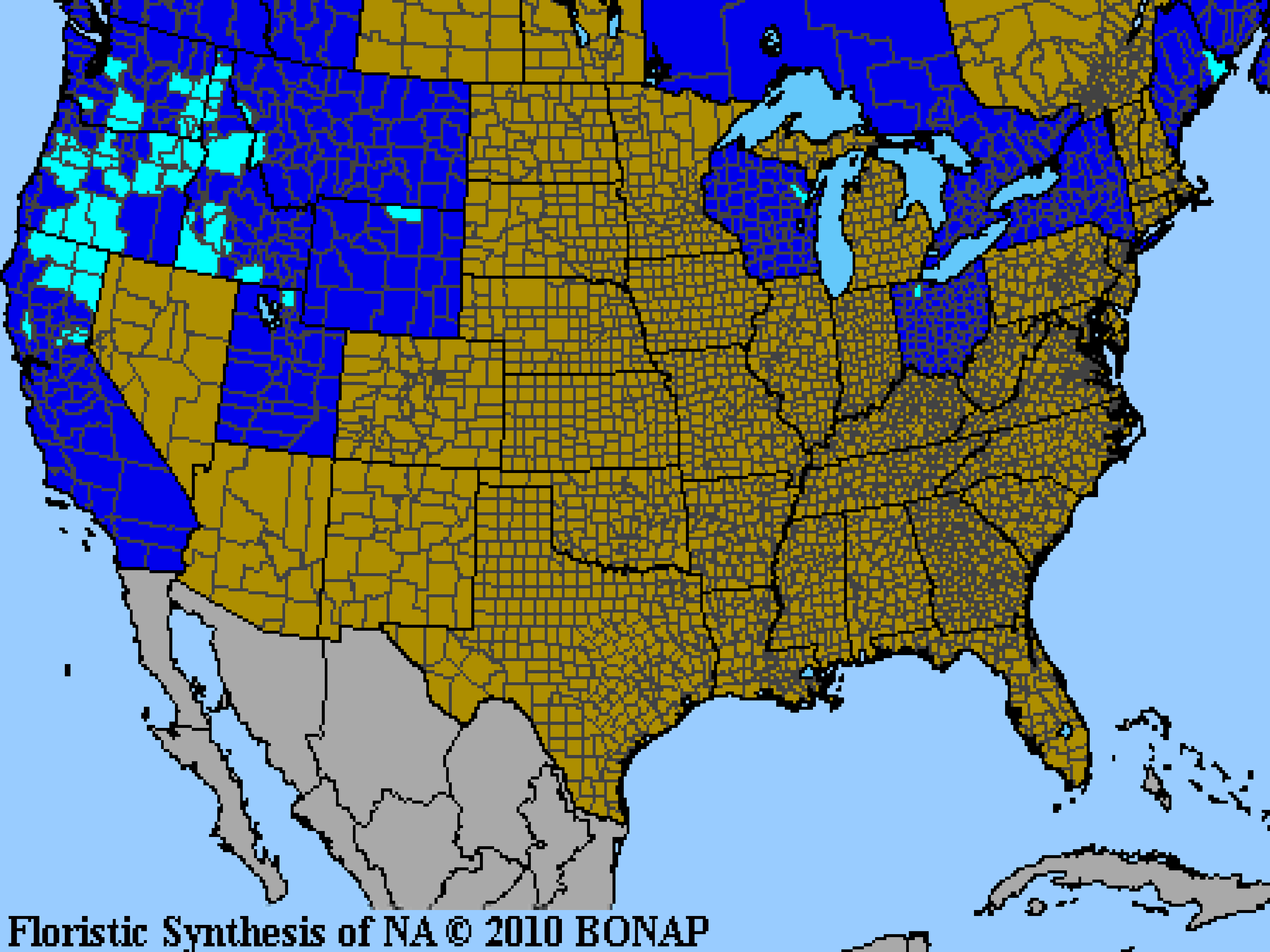
Ventenata dubia



Distribution of Ventenata in North America



- Native to Mediterranean climates of Europe Asia and N. Africa
- First discovered in N. America in WA 1952
- Spread throughout Idaho in the 1980s
- Rapid expansion in Pacific Northwest in 2000's
- In BC canada



Floristic Synthesis of NA © 2010 BONAP

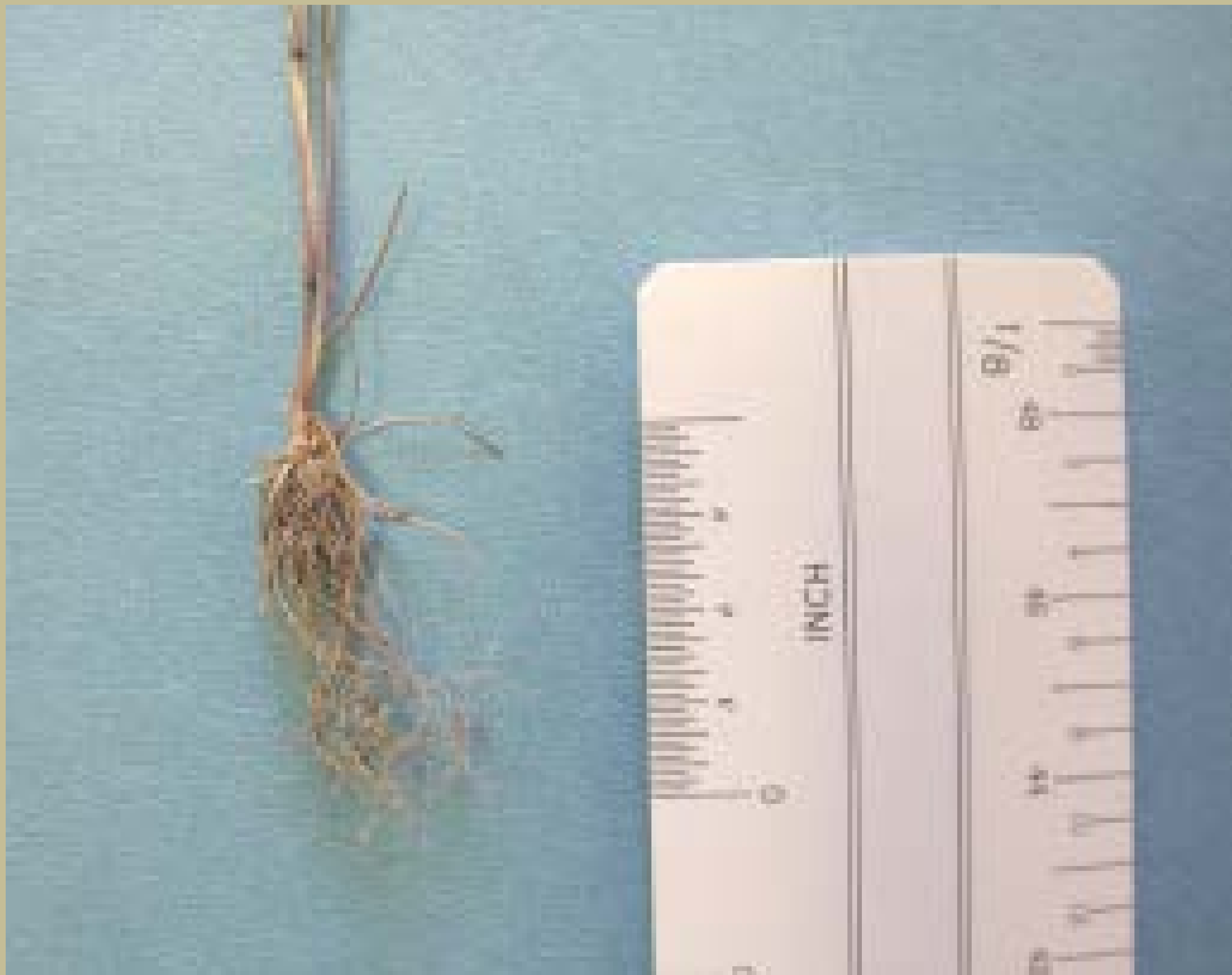
Life history of ventenata

- Winter annual grass (Aveneae tribe)
- Seeds germinate in the fall (need vernalization)
- Produce seed heads in the spring (15-35 seeds/plant)
- Seeds shatter in early summer and drill into ground achieving good soil contact
- 96% germination
- **Short-term viability -1year (2yrs if very cold)**
- If mowed or grazed, regrows with seed heads

Habitat

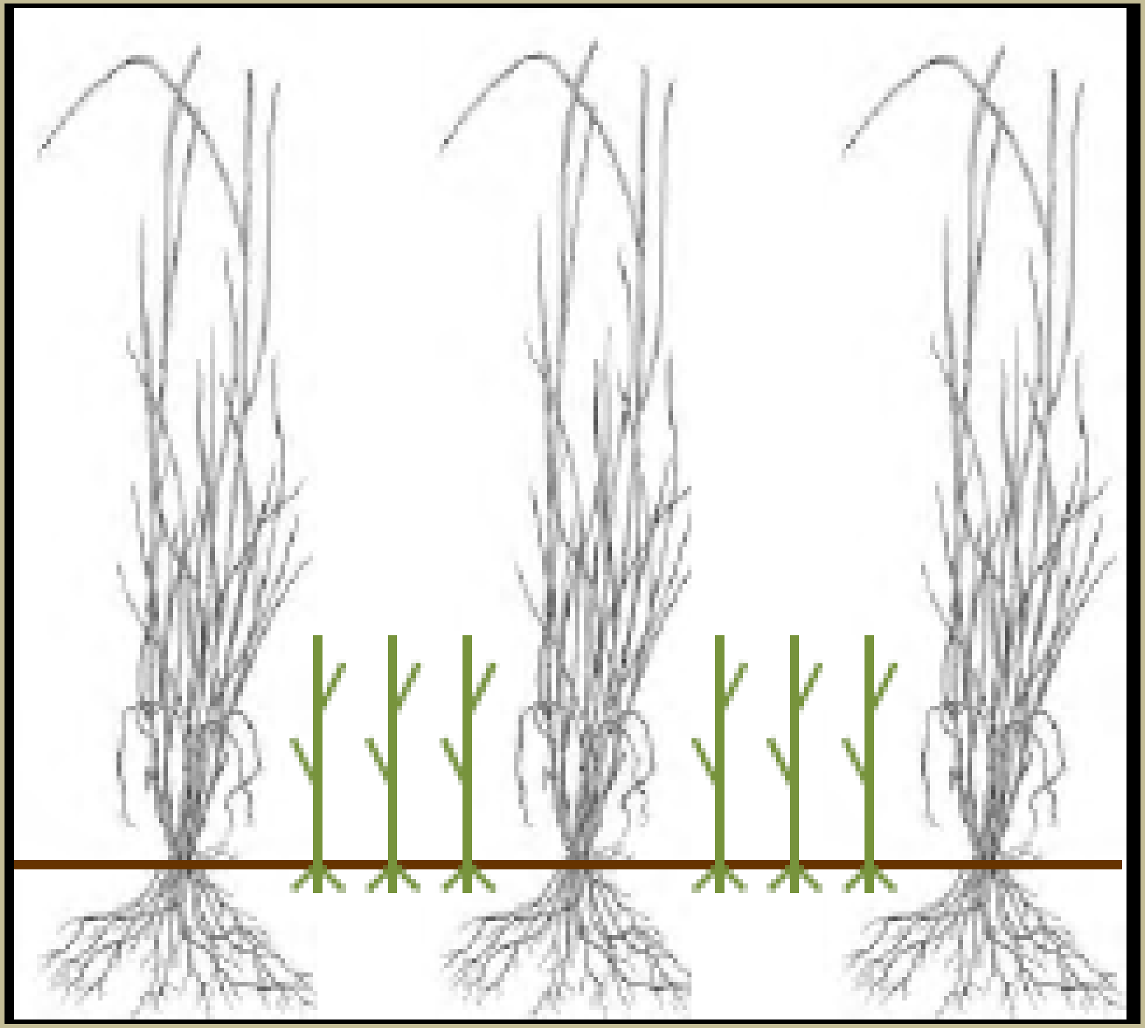
- Disturbed sites along road sides, range land, pastures, **scablands**
- Ventenata is found on sites receiving 14-44 in of annual precipitation and ranging in elevation from 30ft-7,700 ft
- Most commonly found on south facing slopes in shallow, rocky clay or clay loam soils that get spring moisture
- Dispersed by livestock, hay, ATV’s, vehicles

Shallow rooted



Pamela Pavek

Colonizes unexploited resources



Pamela Pavek

Ecological Impact

- Rapid spread and adaptation (becoming larger)
- Difficult to control
- **May displace native bunchgrasses and forbs**
- Appears to outcompete cheat grass and medusa head
- Poor forage for wildlife, livestock
- Contaminates certified “weed free” hay in WA and ID, as well as other crops

Treatment

- Resistant to glyphosate and sethoxydim and other foliar herbicides
- Imazapic has been successful at treating ventenata in the spring (Van Fleet 2007)
- No biocontrols available
- Mowing, grazing not effective
- Managing for low nitrogen levels

Management Objectives

- Prevent establishment of ventenata in scablands not yet colonized
- Treat ventenata in rare plant habitat where it may be displacing native bunchgrasses

Is ventenata the culprit?

- Is ventenata actually competitively displacing rare needlegrass populations, if so through what mechanisms?
- Are there other contributing factors/stressors that make a site more vulnerable to invasion by ventenata such as a loss of biocrust?

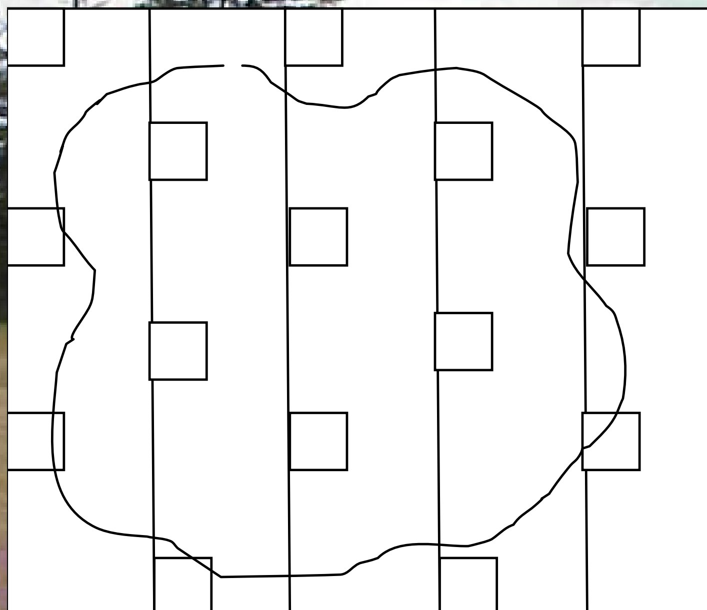
Our Approach
Multiple Stressor Risk Assessment

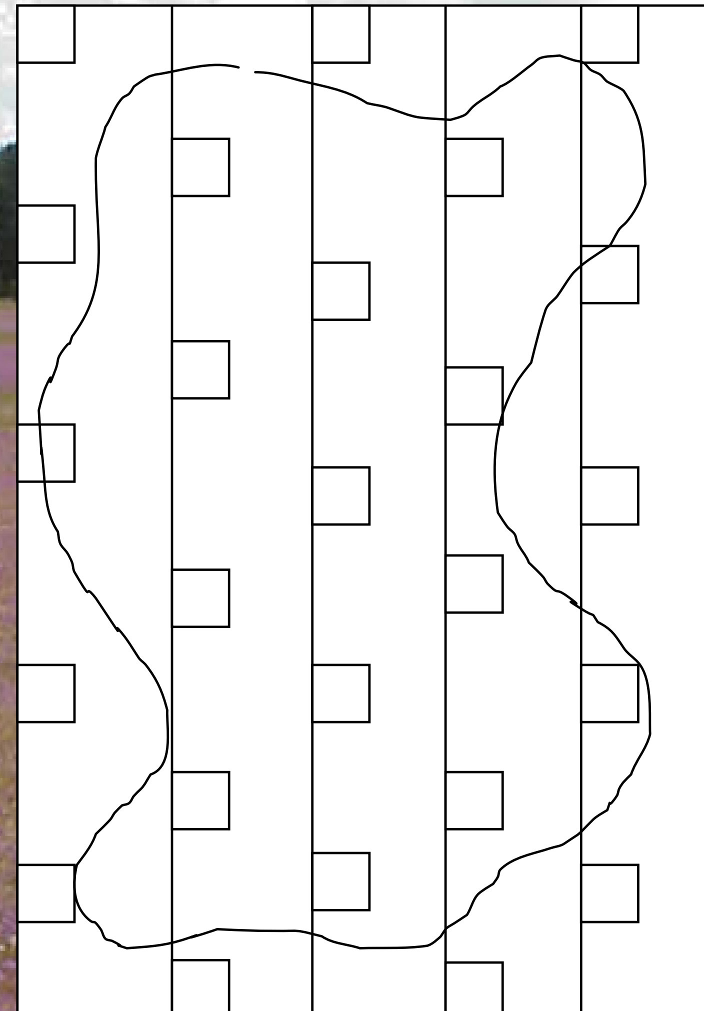
1. What ecological and environmental conditions exists in areas with relatively large, populations?
   - Identify potential limiting resources in the absence of exotic, invasive species
   - Baseline risk assessment
2. How do conditions differ when invasive annual grasses are present?
3. Can we identify geographic attributes that can be used to target “at risk” populations?

Data collection

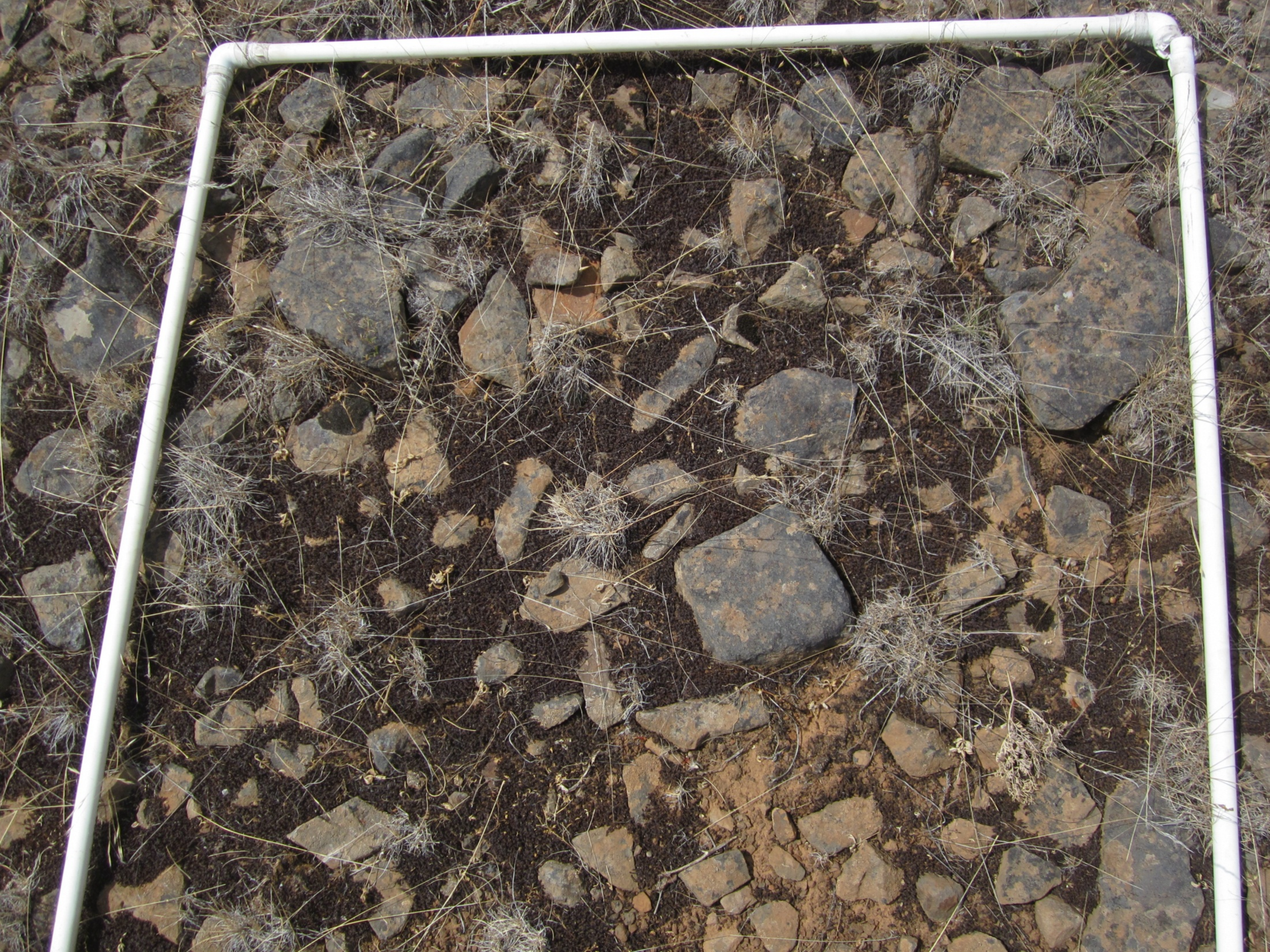
Sampling design

Fig.1 Schematic of Permanent Plots and Sampling Design





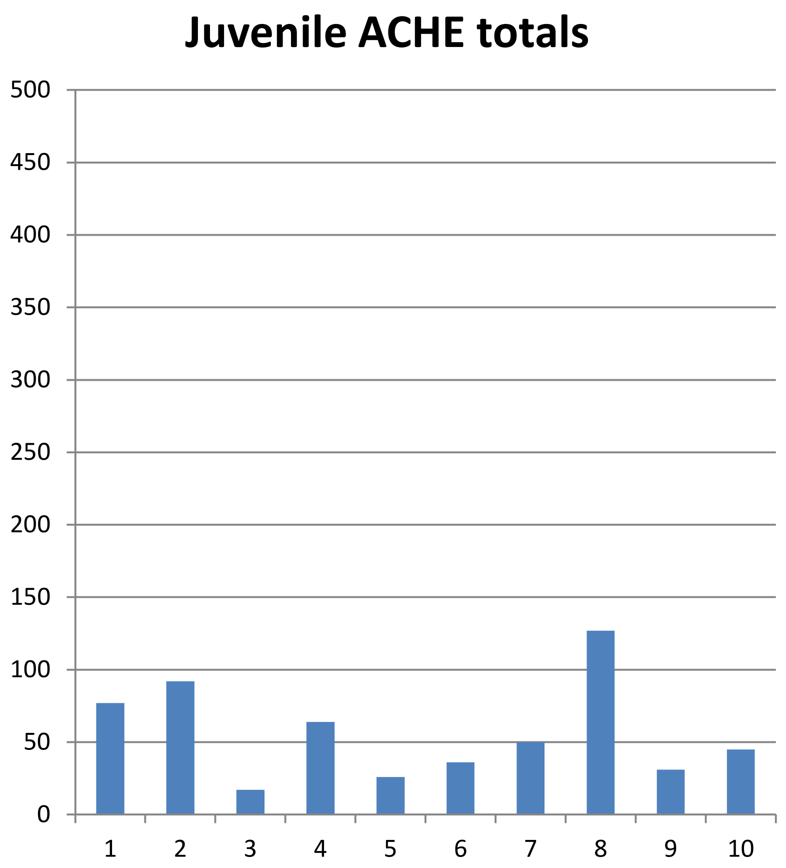
Two examples of permanent mega-plots encompassing *Achnatherum* populations of different sizes. Mega-plots will be gridded with fixed transects spaced 50-meters apart. Sub-plots (1-m^2) will be fixed along transects at 5-meter intervals. (note: not drawn to scale).

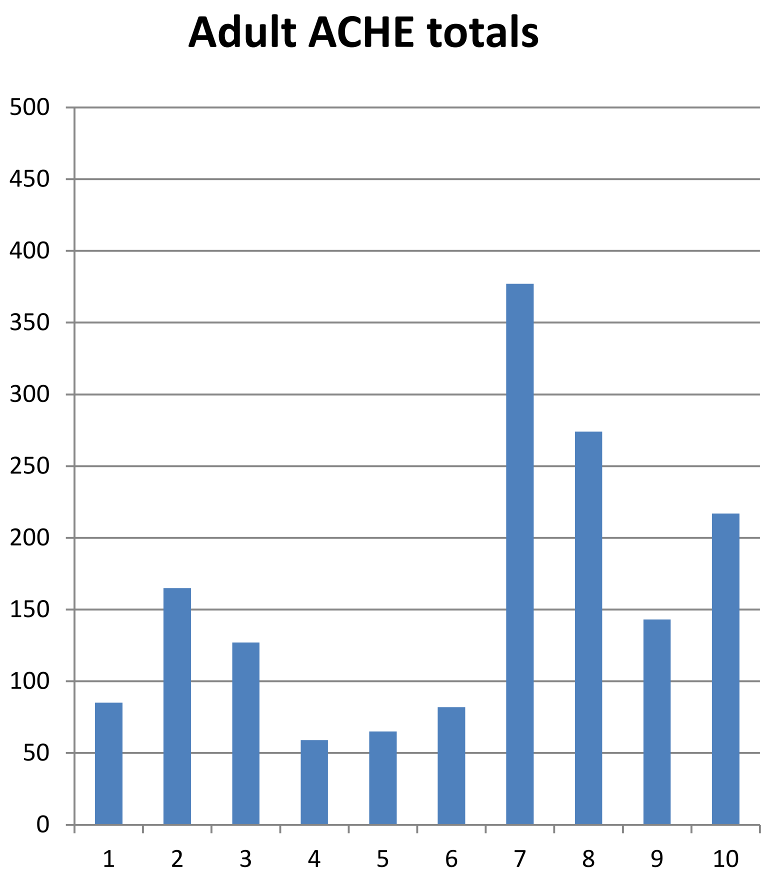


Soil samples

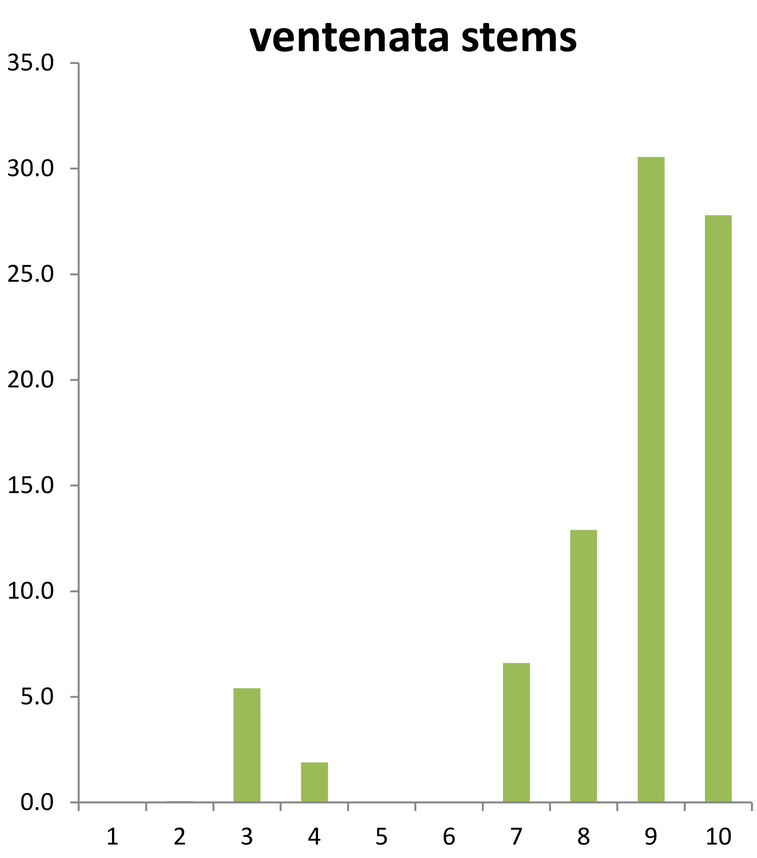
Monitoring

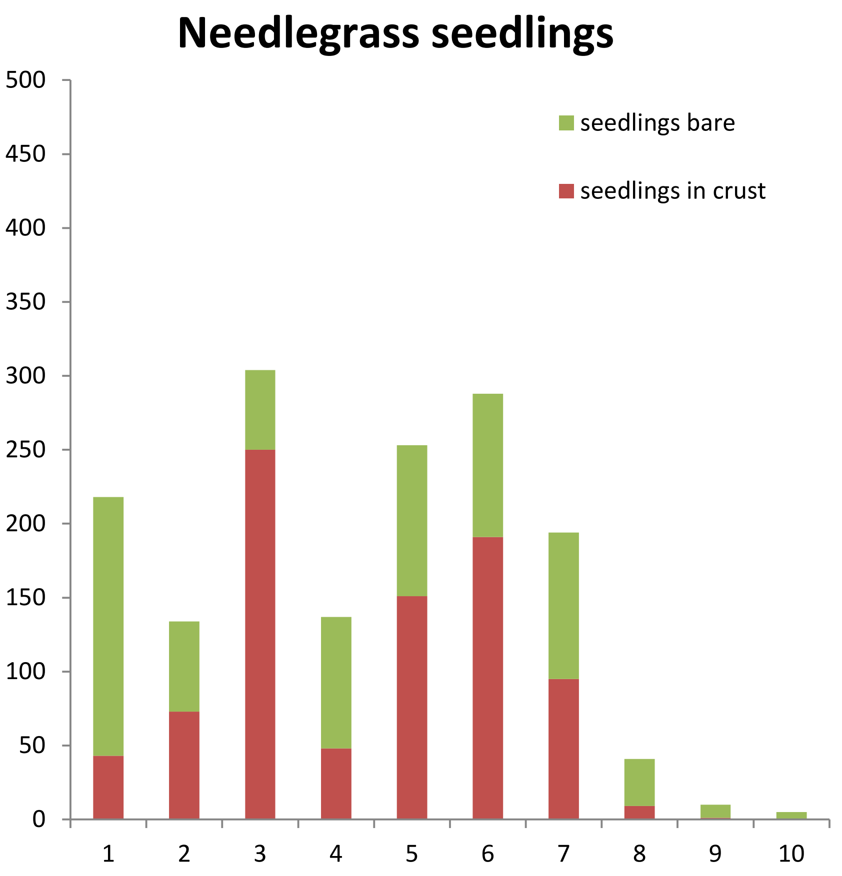
Size class distribution

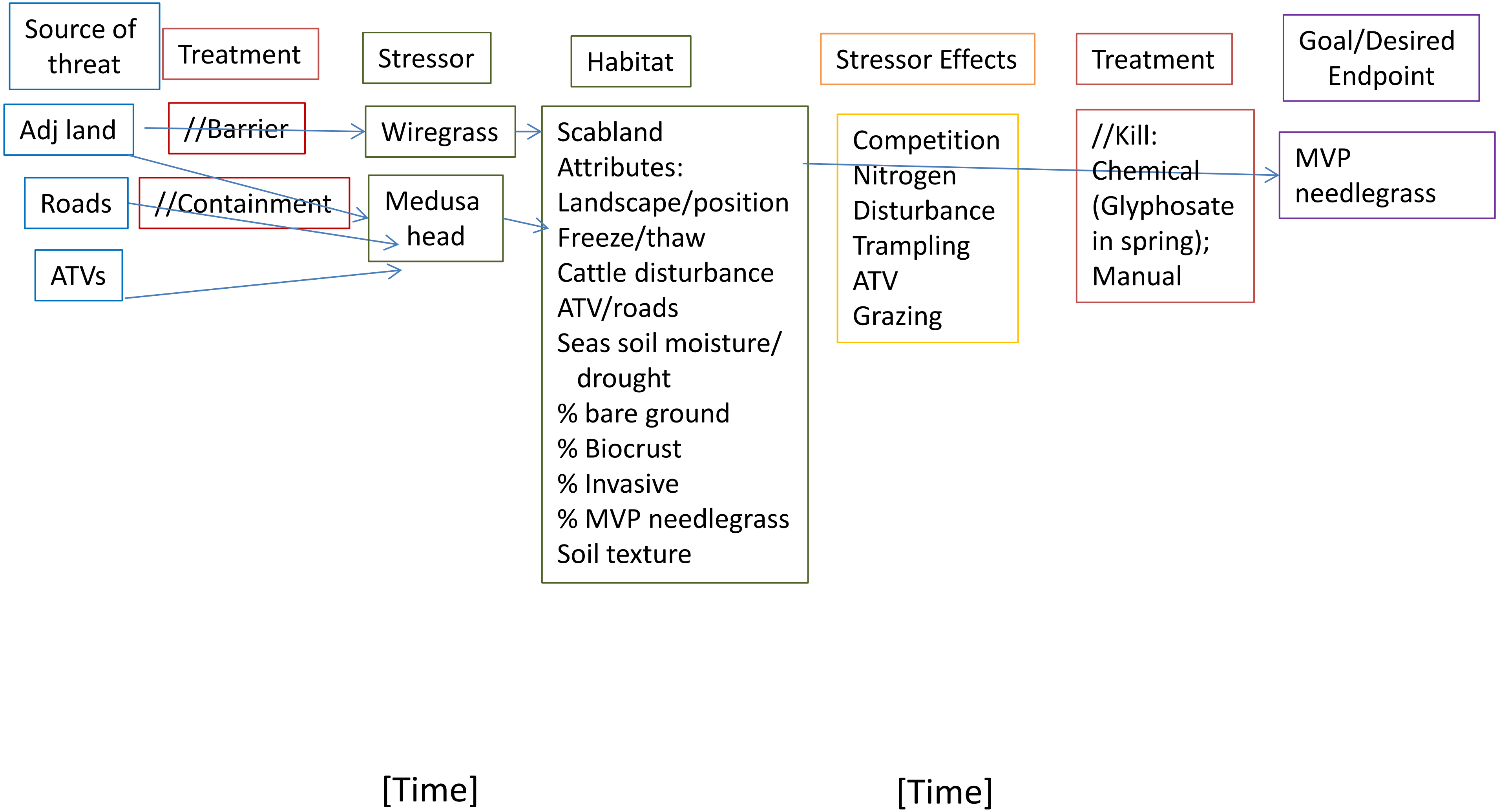




Seedling establishement







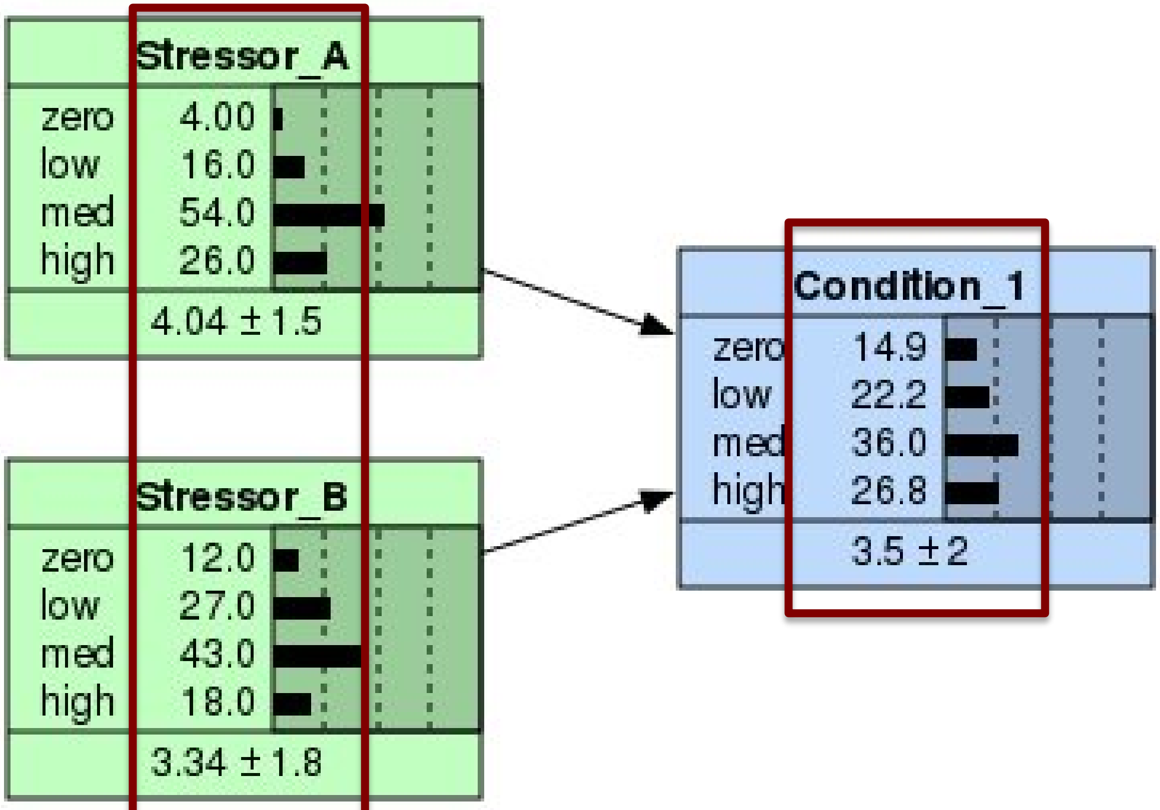
Needlegrass response to stressors (invasives wiregrass, medusa head), key attributes of habitat needed to understand response of needlegrass and its interactions with invasives and their potential effects , types and timing of treatments, and desired endpoint clearly defined (From Krista Lopez/Ochoco NF).

Risk Assessment Approach

1. Identify spatial relationship between sources of multiple stressors, exposure levels, and the needlegrass population endpoint
2. Link stressors to endpoint via exposure and cause-effect pathways with a conceptual model

3. Develop a Bayesian Network model that reflects the conceptual model to assess risk to the endpoint of interest

Bayesian Network Model Construction



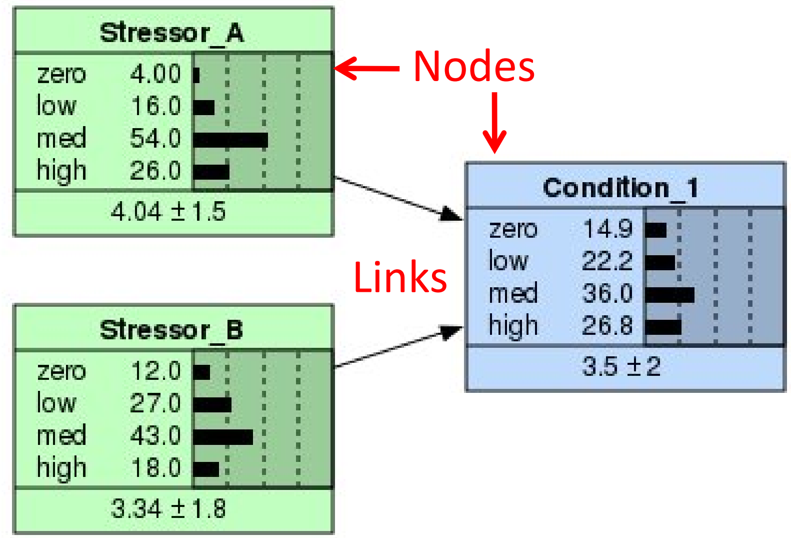
Frequencies determined by spatially-explicit data

Frequencies determined by the CPT

Elements of a Bayesian Network Model

1. Nodes - management system variables with multiple states
2. Links - causal relationships between these nodes
3. Conditional Probability Tables – sets of probabilities specifying the likelihood that a node will be in a particular state given the states of its parents

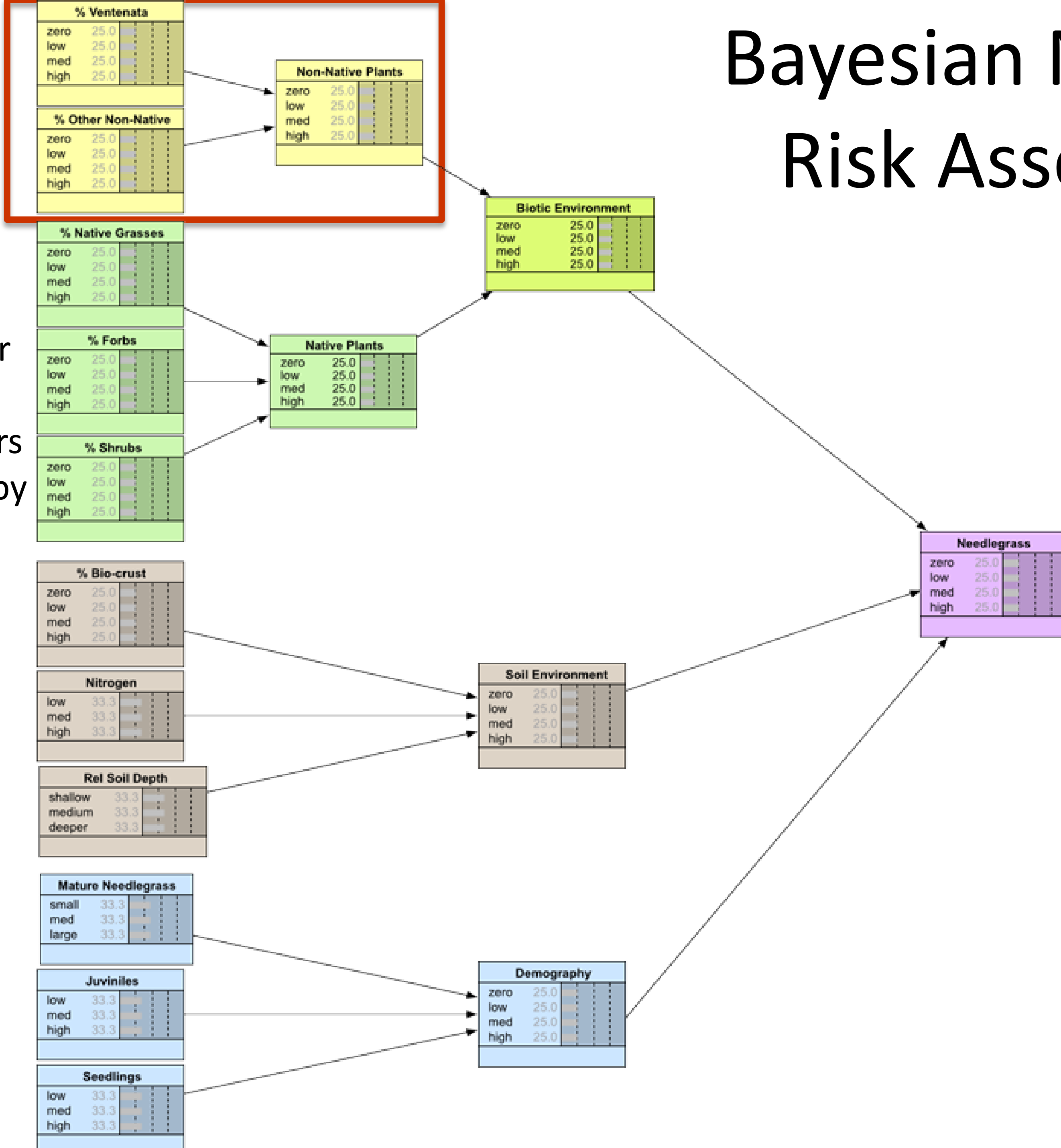
Modified from Cain 2001



Stressor_A	Stressor_B	zero	low	med	high
zero	zero	100.00	0.000	0.000	0.000
zero	low	90.000	8.000	1.500	0.500
zero	med	75.000	20.000	4.000	1.000
zero	high	60.000	25.000	10.000	5.000
low	zero	75.000	20.000	4.000	1.000
low	low	50.000	35.000	10.000	5.000
low	med	25.000	35.000	30.000	10.000
low	high	10.000	30.000	45.000	15.000
med	zero	25.000	35.000	30.000	10.000
med	low	10.000	30.000	45.000	15.000
med	med	5.000	25.000	50.000	20.000
med	high	1.000	9.000	40.000	50.000
high	zero	15.000	25.000	40.000	20.000
high	low	10.000	15.000	35.000	40.000
high	med	5.000	10.000	30.000	55.000
high	high	1.000	4.000	20.000	75.000

Bayesian Network Risk Assessment Model

Values for input parameters collected by K. Lopez (USFS) in 2012



Moving Forward

1. Analyze risk for Henderson’s needlegrass populations with few or no invasive species (baseline risk)
2. Analyze risk for populations that have large percent cover of invasive species
3. Compare the risk calculations for the two analyses to gauge likelihood of an impact from invasive, annual grasses

Significance

- Bayesian network risk assessment models have been successfully applied to large spatial scales
  - This project uses same approach, but at a much smaller spatial scale.
- Critical analysis of the value of risk assessment in adaptive management approach to species conservation

Acknowledgements

- **ISSSSP**- funded baseline data collection for Henderson's needlegrass demography and scabland habitat conditions
- **WWETAC** funded WWU Wayne Landis and Kim Ayre to contruct Bayesian/Risk assessment model