

Genetic Analysis of Restoration Plant Species in the Canyonlands Region

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Project Overview

- Examining 3 species: Indian ricegrass, globemallow, sand dropseed
- Empirical Questions:
 - Is there significant genetic variation within the species?
 - If so, how is it structured across the landscape?
 - Do marker allele frequencies covary with environmental features?
- What implications do these data hold for restoration at degraded sites within the Parks?



Indian ricegrass



Photo by Mark Miller

- Selfing, perennial, cool season grass
- Pioneer species (soil stabilization)
- Broad Ecological Amplitude, e.g., 2–10,000 ft.
- Drought Tolerant
- Cultivars available but lack information on scale of local adaptation across natural pops

Stipa (Achnatherum) hymenoides

Small-flowered Globemallow



- Outcrossing, perennial
- Colonizer, weed-tolerant
- Short-lived = metapopulations
- No official releases

Photo by Mary Moran

Sphaeralcea parvifolia

Sand Dropseed



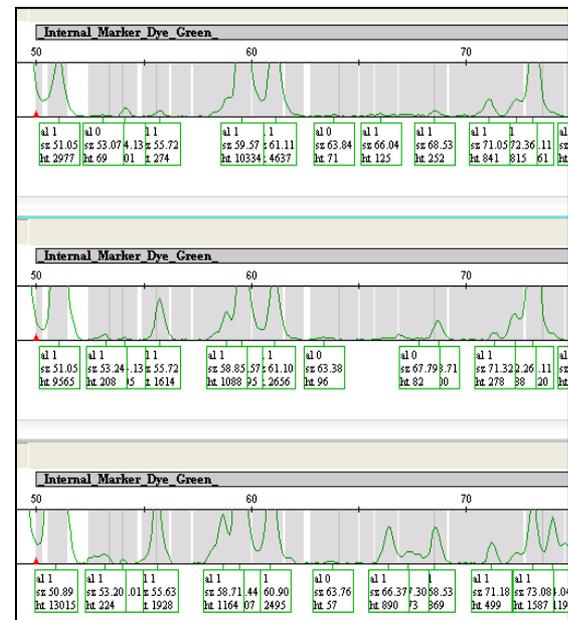
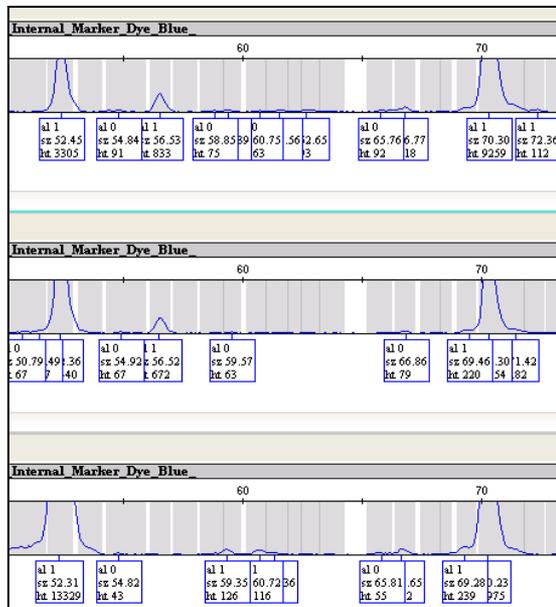
- Selfing (?), perennial, warm season grass
- Pioneer species (soil stabilization)
- Very widely dispersed
- Strong ecological differentiation
- Cultivars available, local sources underway

Photo by Mary Moran

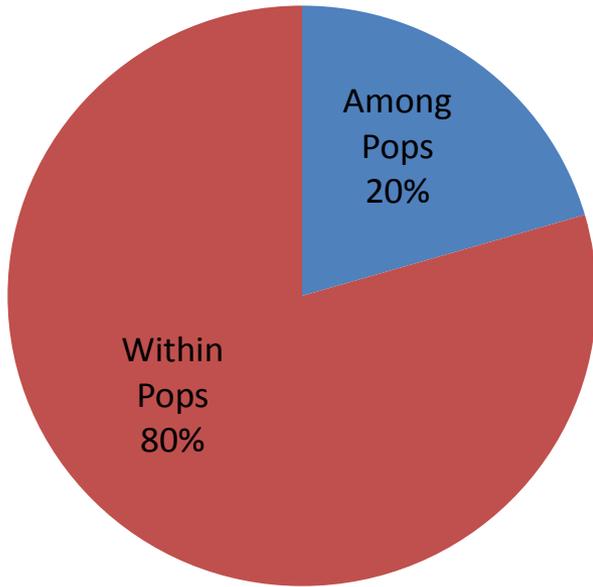
Sporobolus cryptandrus

Data set

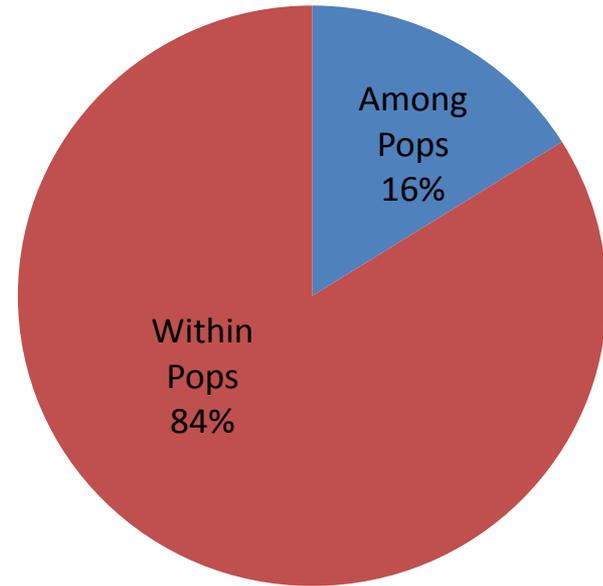
Taxon	Populations	Individuals	Markers
Indian ricegrass	44	308	266
Sand dropseed	24	184	281
Globemallow	23	162	309



AMOVA Results



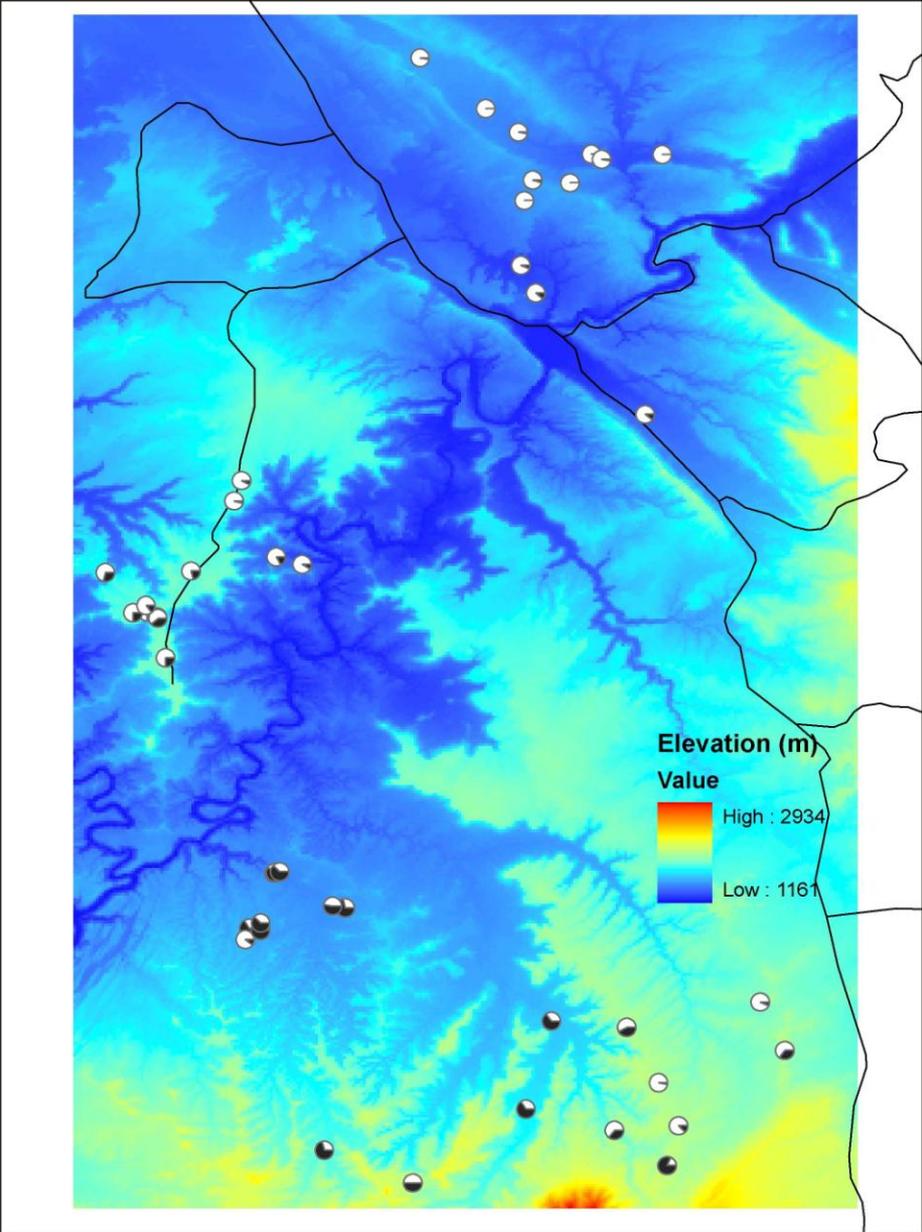
Indian ricegrass

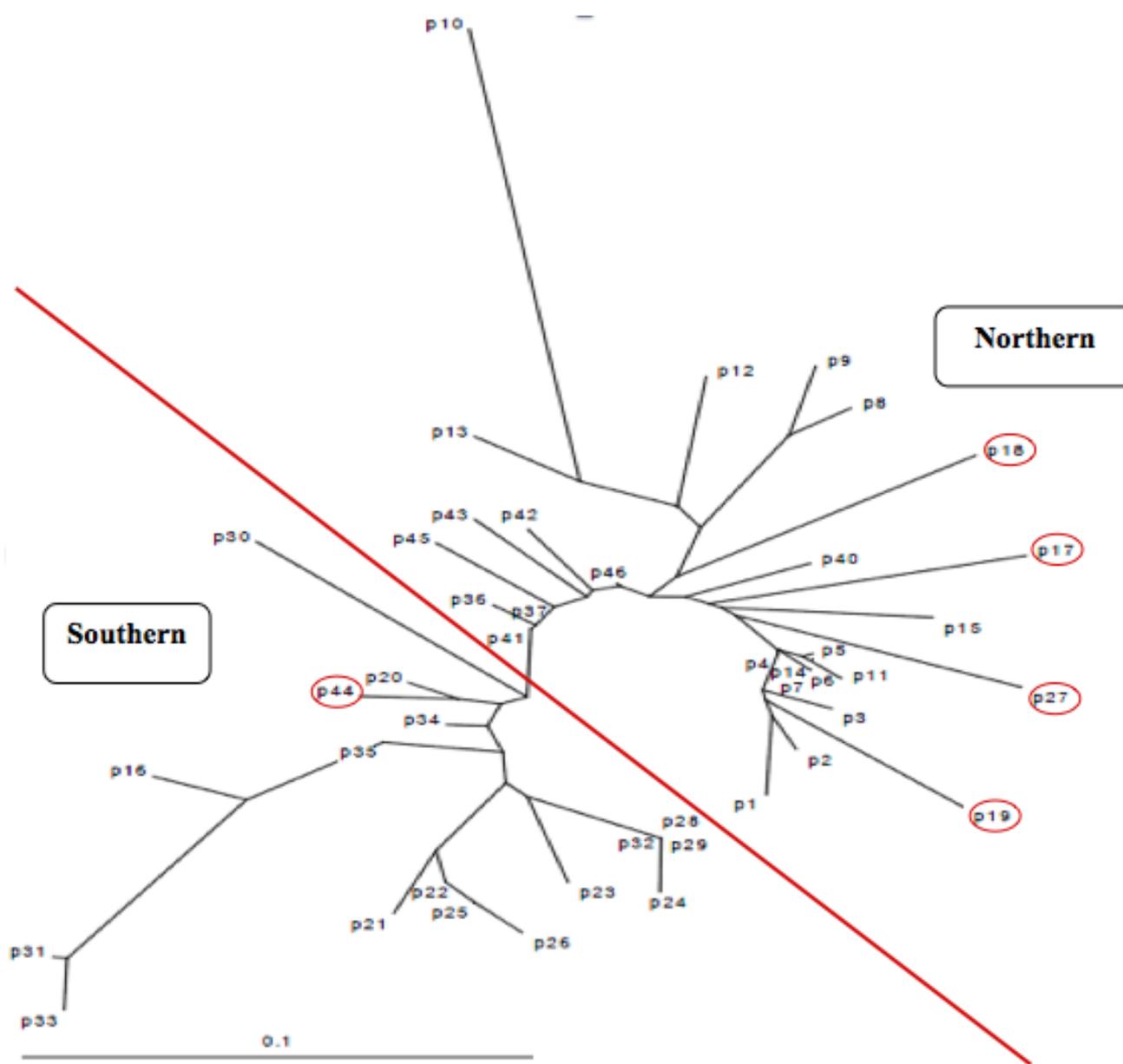


Small-flowered globemallow



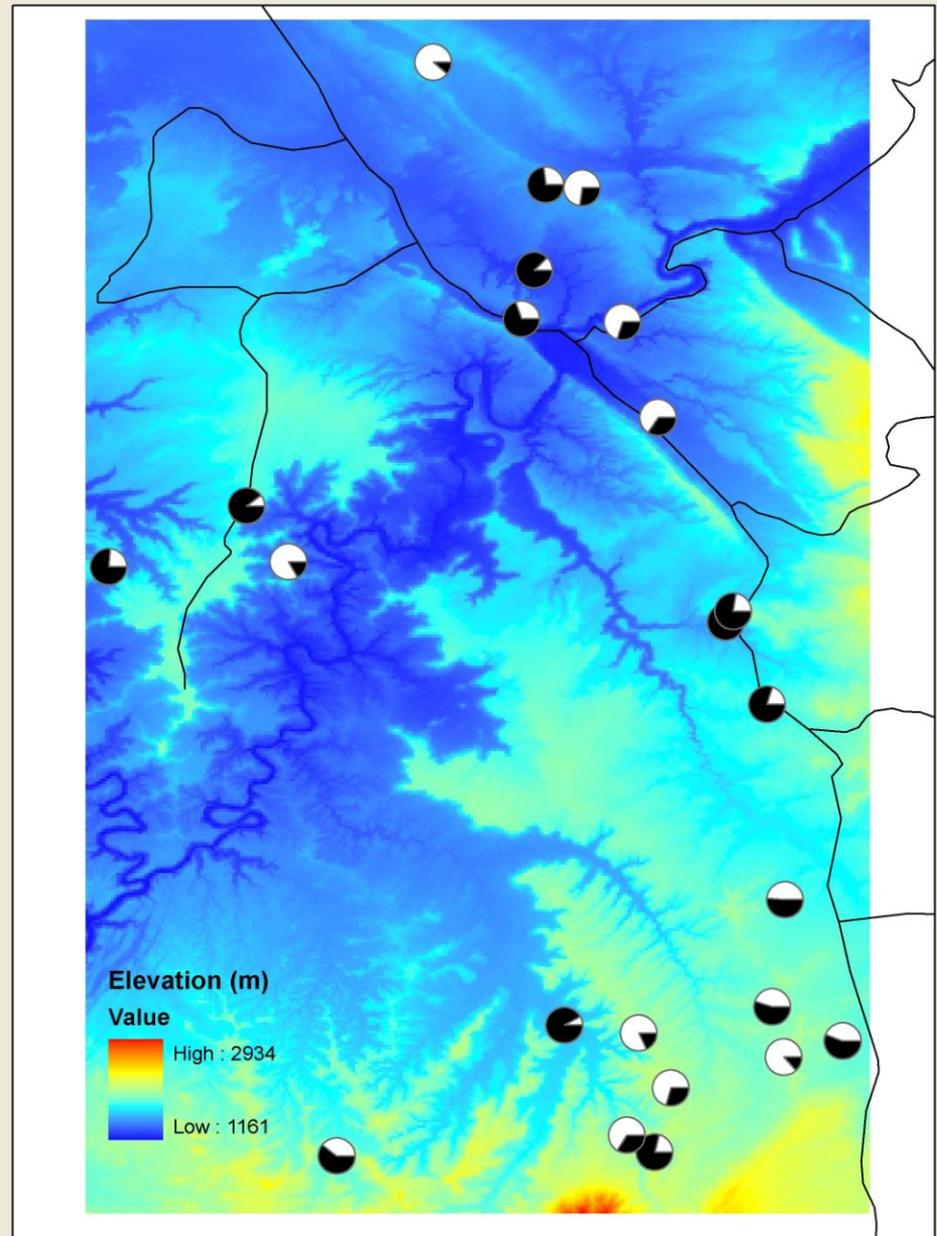
Indian ricegrass





Unrooted neighbor-joining dendrogram of ricegrass populations

Small-flowered globemallow



Isolation by Distance

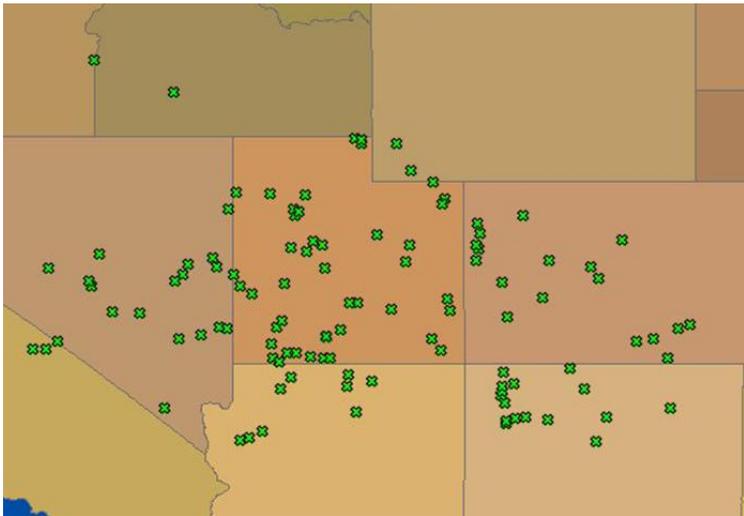
Species	r	P-value
Indian ricegrass	0.203	0.0005
Sand dropseed	0.48	0.0001
Globemallow	-0.0176	0.426

Genetic Variation by Elevation

Species	r	P-value
Indian ricegrass	0.09	<u>0.048</u>
Sand dropseed	0.02	0.371
Globemallow	0.03	0.313

Broader Analysis of Ricegrass

with RC Johnson and Ted Kisha, USDA ARS



Accessions under evaluation

Two Common Gardens:

- Time to first flower
- Leaf length
- # panicles
- dry weight

Environmental Variables

- Lat/Long
- Elevation
- Temp/Precip

Accessions typed for 75 AFLP markers, with populations bulk sampled

Summary

- In accordance with other studies, find greater genetic structure in selfing v. outcrossing
- The pattern in ricegrass may be the result of drift or selection, but...
- Elevation explains genetic variation in ricegrass; multiple seed sources should be used, even at this small scale

Acknowledgements

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