Dryland Restoration on the Navajo Reservation

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BACKGROUND

Persistent drought, desertification, soil erosion, climate shifts, and human activities threaten arid and semi-arid landscapes in the Navajo Reservation, leading to environmental degradation and societal challenges for residents and the ecosystem.

Navajo Times – D. Quintero

Objectives:

- Identify and select the optimal native grass species for windbreak structures.
- Optimize windbreak layout in a circular design to maximize space for each grass species and provide protection from heavy winds for central forbs.
- Implement an organic and self-sustaining structure to minimize nutrient and soil erosion.

METHODOLOGY

We used only native seeds that were collected from similar elevation ranges (5,000ft – 8,000ft) as the project site: North Leupp Family Farms in Leupp, Arizona. Seeds were grown and tracked at the NAU Research Greenhouse.

Native Grasses:

- *Bouteloua gracilis*
- *Sporobolus contractus*
- *Sporobolus cryptandrus*
- *Sporobolus airoides*
- *Muhlenbergia pungens*
- *Achnatherum hymenoides*

Native Forbs:

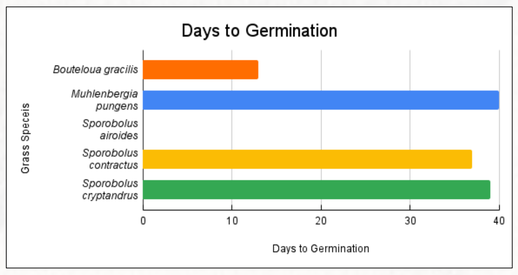
- *Linum lewisii*
- *Thelesperma subnudum*
- *Artemisia frigida*
- *Gallardia pinnatifida*
- *Penstemon strictus*
- *Dietaria canescens*
- *Achillea millefolium*
- *Heliomerus multiflora*
- *Eriogonum racemosum*

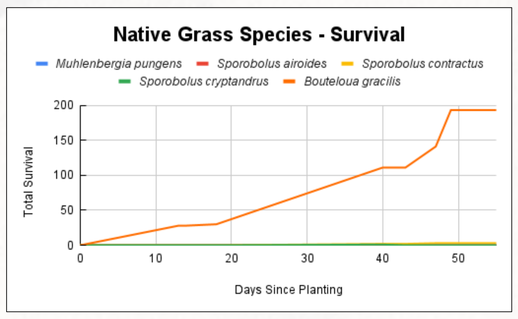
Pilot Study – *Achnatherum hymenoides* – Germination Trial

Seeds were collected in 2020 and utilized for these germination experiments. Half of the seeds were treated with three different 20% acidic solutions (acetic, phosphoric, and sulfuric acids), while the other half underwent scarification with sandpaper before acid treatments. Immediately after, seeds were placed in cold/wet stratification at 40°F and were planted two weeks later.

RESULTS

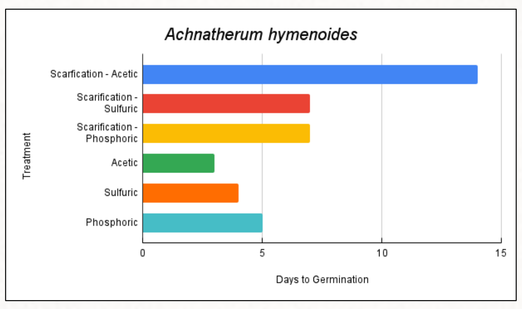
Bouteloua gracilis grass shows the most promising growth, with over 83% germination rate overall, whereas other grass species were 5% and below. Reports suggest it can expand to a circumference of 12-15 inches. Given this, it's sensible to design the plot to maximize grass coverage while minimizing forbs for an effective windbreak system.

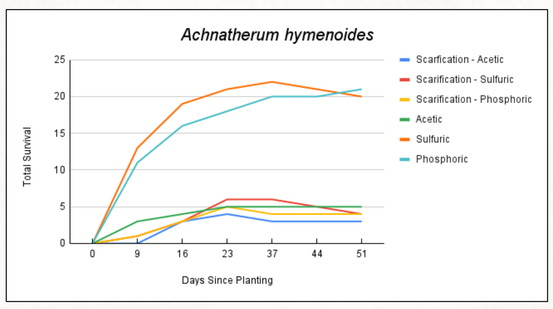




Pilot Study – *Achnatherum hymenoides* – Germination Trial

The optimal treatment regimen consisted of four years of storage, followed by a 20% acidic treatment using Sulfuric or Phosphoric acids, and cold stratification prior to planting.





FUTURE DIRECTIONS

Native Seed Collection

- Species & dormancy needs

Plot Design and Project Site Layout

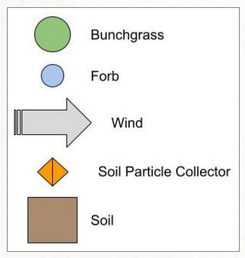
- Horizontal layout & irrigation feasibility

Wind Erosion Capabilities

- Measure effectiveness

Biocrust Enhancement

- Nutrient & soil stabilization



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