SOUTH TEXAS ECOTYPE APPROACH TO RANGELAND RESTORATION

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Plant Materials Center

- A Division of the Natural Resources Conservation Service
- 25 centers across the US
- Develop plant releases and technology to meet conservation needs
- Work mainly with native plants
South Texas Natives

- A Mutually Beneficial Partnership
  - Part of the Caesar Kleberg Wildlife Research Institute at TAMUK
  - Formed due to the lack of commercially available native materials adapted to South Texas
  - Brought in 2,000+ collections since 2001
  - Numerous off-site evaluations & plantings
  - Co-released 29 species
Goals and Objectives

- Seed Mixes
- Effective Planting Strategies
- Education Program
Eco-regions of South Texas
Why Plant Native Seed?

- Millions of acres of south Texas rangelands have been converted or invaded by exotic grasses.
- Exotic monocultural grass pastures have negative implications for wildlife.
Understand the Invasion

- Exotic grasses exploit vacant sites.
- Restoration sites are commonly reinvaded quickly by exotic grasses.
Causes Of Plant Community Change

- Site Availability
- Species Availability
- Species Performance
Invasive Grasses

- Study by Mitch Greer (SER 2015)
  - Yellow bluestem leachate and leaf litter profoundly reduced the germination and survivorship of native seedlings.
  - Arbuscular mycorrhizal fungi (AMF) is altered by exotic grasses.
  - Native climax grasses are AMF dependent.
  - Non-AMF dependent
    - Invasive – Buffelgrass
    - Early Successional Native – Hooded Windmillgrass
Processes Affecting Change

- Disturbance
- Dispersal
- Reproduction
- Resource Acquisition
- Response to Environment
- Life Strategy
- Stress
- Interference
Successful Restoration

- Identify native plants that are adapted to your area and can compete with exotic grasses.
- Native plants must be used to attack all aspects of the exotic grass’s life cycle.
- Rapid resource capture at the site following disturbance is critical.
- High-diversity native communities increase invasion resistance.
Plant Functional Groups

- Warm season and cool season plants
- Early and late successional plants
- Annual and perennial plants
- Grass, forb and legume representatives
- Caespitose, rhizomatous and other growth forms
Restoration Seed Mixes

- Focus on plant functional groups from a concise regional area.
- Select for genetic and environmental adaptation.
- Provide grower and user-friendly material.
- Release after proven success only!
Ecotype Release vs. Cultivar

- **Ecotype Concept**
  - A mix of numerous collections of a species
  - A broad spectrum of the genetic makeup adapted to a specific ecoregion
  - Used to restore local habitat
  - Not an exact match, but closer than seed from out-of-region origins

- **Cultivar**
  - Usually bred and “improved” by selection
  - May be better for increased forage production or in highly disturbed sites with competition from numerous exotic species
Higher genetic variation compared to single site

- Increases likelihood that genes for adaptation will be present (over 1 accession)
- Natural selection will operate more easily on genetic material possessing greater diversity
- Especially appropriate for a species that exhibits continuous genetic variation
  - Long-lived, wind pollinated, cross pollinating, perennials
Ecotype Release

- **Process**
  - Collect seed from natural populations within an ecoregion
  - Intention is to capture locally adapted genetics
  - Collections are compared for critical traits, and selections are made for a release
  - No breeding is done for “Natural Track” releases
Ecotype Release

- To obtain desirable traits without breeding
  - Different collections may stand out in vigor, seed production, or active seed germination
  - It may be that no collection has all of the desirable traits
  - Lines can be produced separately, and seed can be blended before sale
Types of Seed Releases

- Single Accession
- Multi-accession
- Multi-species Blends
Single Accession Seed Release

- Mariah Germplasm Hooded Windmillgrass
  - Chloris cucullata
  - Kenedy County
Characteristics:
- Short, perennial bunchgrass
- Multiple seed crops
- High active germination (90%+) typically in first 3 days
- Reseeds itself and spreads by stolons
- Used for erosion control and roadsides
Multi-Accession Seed Release

- La Salle Germplasm Arizona Cottontop
  - *Digitaria californica*
  - A blend of 12 South Texas collections
La Salle Germplasm Arizona Cottontop

- **Characteristics:**
  - Native, perennial bunchgrass
  - Produces abundant seed throughout the year
  - Good forage for livestock and good cover for wildlife
  - Plants are long lived and very drought tolerant
  - Has shown excellent seed quality
  - Averaging 62% active germination
La Salle Germplasm
Arizona Cottontop

- 8 Different Counties
- Soil Types
  - Sandy Loam
  - Loam
  - Clay Loam
Multi-Species Seed Release

Requirements:
- Landowners
  - Stand establishment
  - Active Germination
- Seed Producer
  - Consistency
  - Growth Form – Height
  - Seed Maturity
Ecotype Blend

Why mix multiple species releases in a blend?

– A blend of species within the same genus may be more practical to meet a vegetative need
  ▪ If they all occur within the ecoregion of use, but on slightly different micro-sites
  ▪ Avoids the necessity of choosing the correct species when seeding a site
  ▪ 2+ are included and one or more should thrive
Bristlegrass

Characteristics:

- Native, warm-season, perennial bunchgrass
- Adapted to various soils
- Provides moderate to high quality forage for livestock
- Seed characteristics are favorable for birds, like quail
Catarina Germplasm Bristlegrass Seed Germination

MidWest Seed – Beeville Harvest 2004:

- 819 – viability 50%, active germination 9%
- 648 – viability 60%, active germination 48%
- 820 – viability 49%, active germination 3%
- 677 – viability 83%, active germination 72%
## Catarina Germplasm Bristlegrass

<table>
<thead>
<tr>
<th>Accession</th>
<th>County</th>
<th>Soil Type</th>
<th>Seed Yield (#/acre)</th>
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<tbody>
<tr>
<td>648</td>
<td>Webb</td>
<td>Clay</td>
<td>108</td>
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<tr>
<td>677</td>
<td>Karnes</td>
<td>Clay</td>
<td>108</td>
</tr>
<tr>
<td>819</td>
<td>Bexar</td>
<td>Silty Clay</td>
<td>275</td>
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<tr>
<td>820</td>
<td>Willacy</td>
<td>Fine Sand</td>
<td>544</td>
</tr>
</tbody>
</table>
Multi-Species Seed Release

- Catarina Germplasm Bristlegrass
  - A mechanical blend of 4 South Texas collections
  - 2 species
    - *Setaria vulpiseta*
    - *Setaria leucopila*
Land Use History & Successful Seeding

- Degraded Native Sites (83%)
- Exotic Grass Diversification (75%)
Land Use History & Successful Seeding

BASED on 30 plantings conducted since 2004:

- All used South Texas origin seed
- Sampled late spring & autumn each year
- Overall success rate 79%
- Successful plantings defined as:
  - >0.5 seeded plants/ft² @ 1-2 yrs. after sowing
  - >30% seeded plant cover by 1 yr after sowing
Exotic Grass Pastures

- Success rates have been pretty good (75%)
  - Diversification not elimination
  - Post-planting management critical
Degraded Native Rangeland

- Success rates very high (83%)
  - Minimal seedbed preparation
  - No-till drilling
Site Attributes

- Topography
- Existing Vegetation
  - Competition needs to be eliminated!
Seedbed Conditions

- 100% success in firm, aggregated seedbeds
- Failed seedings were in:
  - Cloddy, uneven seedbeds
  - Loose, fluffy seedbeds
Seedbed Conditions
Planting Dates

- Success by month in South Texas:
  - February – 0%
  - March – 50%
  - April – 66%
  - July – 0%
  - August – 100%
  - September – 88%
  - October – 80%
  - November – 0%
Summary:

- Competition needs to be eliminated.
- Good seedbed preparation must be done.
- The seed must have good seed-soil contact.
- Seed must be planted at the right time.
- Good quality, adapted seed must be planted.
Restoration - Final Thoughts

- High diversity ecotypic seed mixes are critical.
- Difference between Success and Failure
South Texas Ecoregion Seed Mixtures

- Early successional grasses, legumes and annual forbs (50% of mix)
- Mid successional grasses (25% of mix)
- Late successional species rarely establish without other species present (25% of mix)
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