



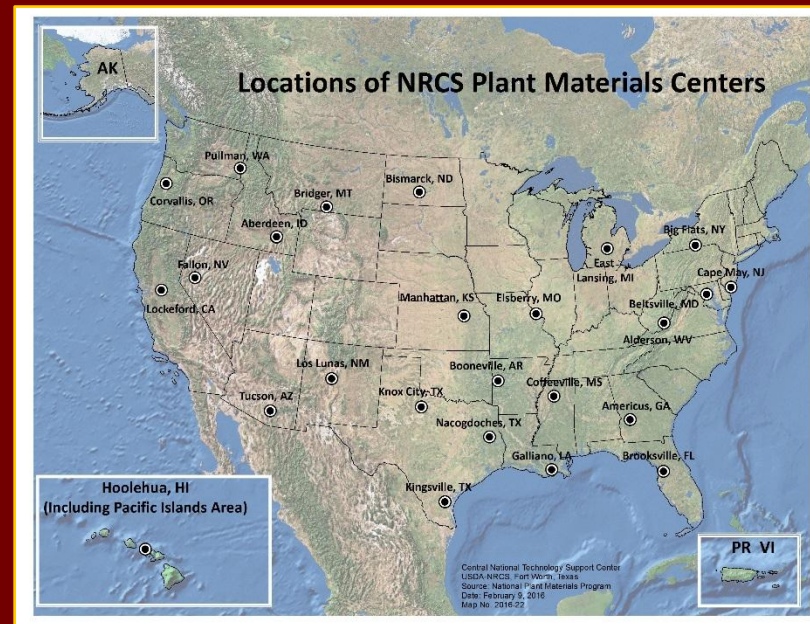
*SOUTH TEXAS ECOTYPE  
APPROACH TO  
RANGELAND  
RESTORATION*

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# E. "Kika" de la Garza 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



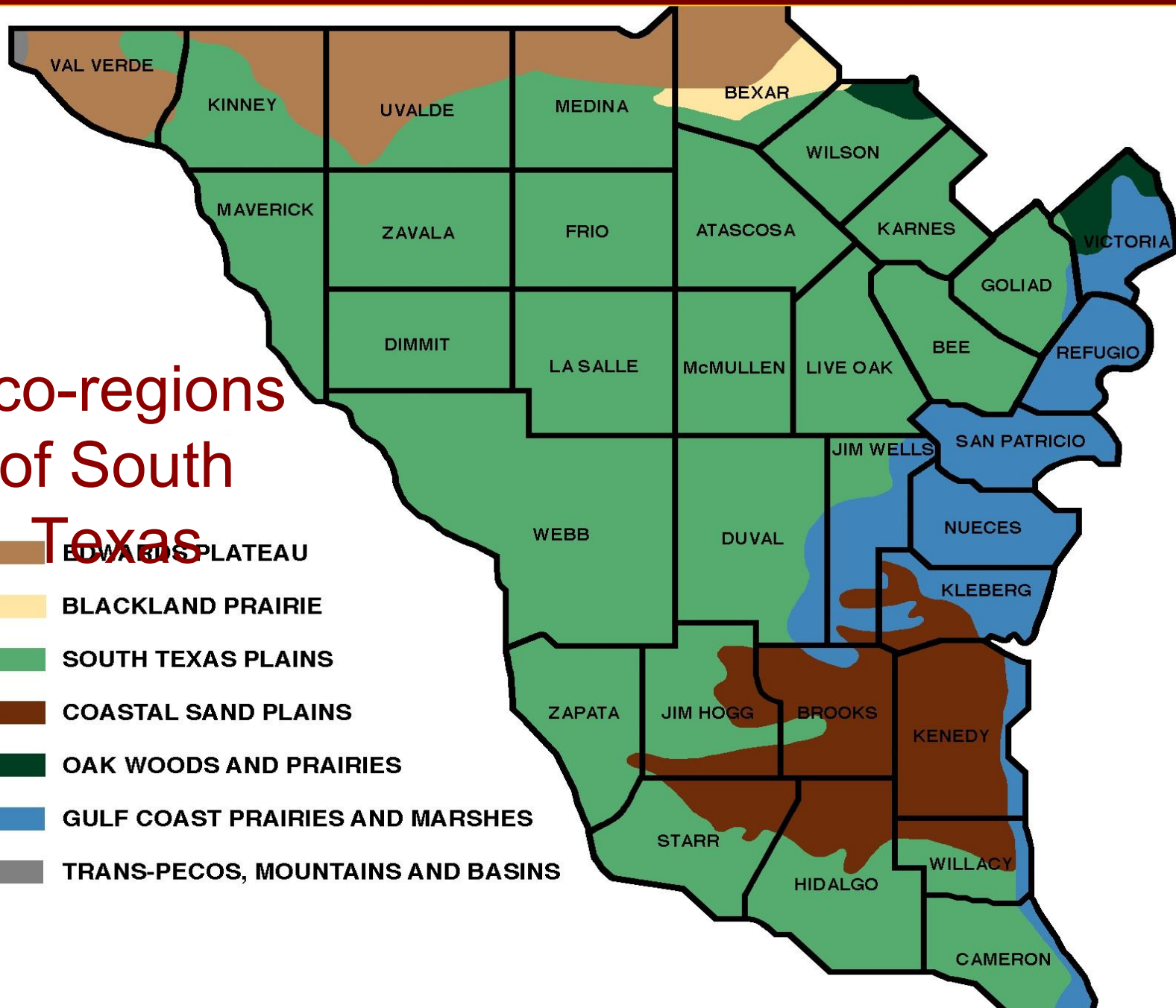
# Goals and Objectives

- Seed Mixes
- Effective Planting Strategies
- Education Program



# Eco-regions of South Texas

- EDWARDS PLATEAU
- BLACKLAND PRAIRIE
- SOUTH TEXAS PLAINS
- COASTAL SAND PLAINS
- OAK WOODS AND PRAIRIES
- GULF COAST PRAIRIES AND MARSHES
- TRANS-PECOS, MOUNTAINS AND BASINS



# 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

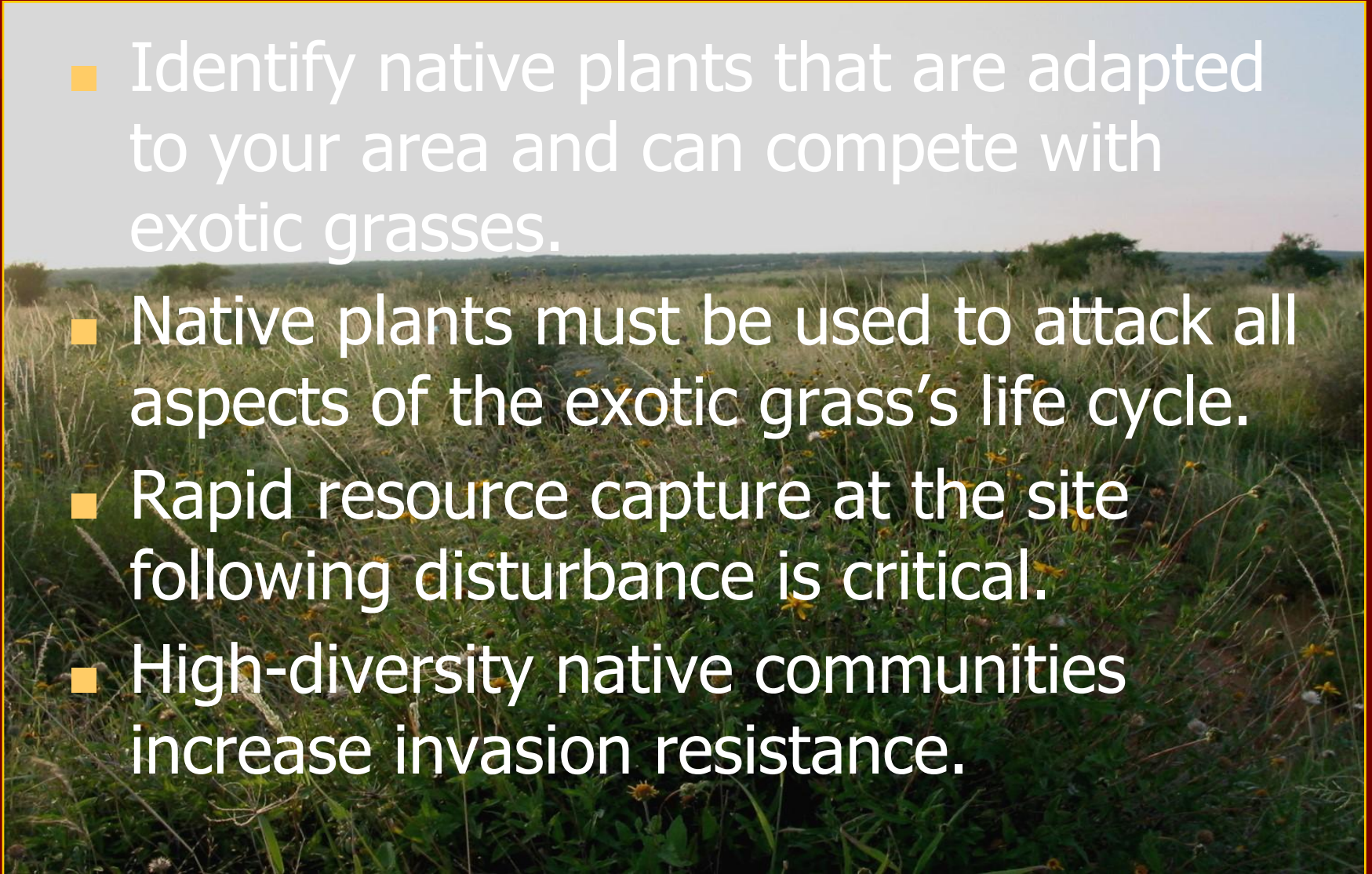
- Study by Mitch Greer (SER 2015)
  - Yellow bluestem leachate and leaf litter profoundly reduced the germination and survivorship of native seedlings.
  - Arbuscular mycorrhizal fungi (AMF) is altered by exotic grasses.
  - Native climax grasses are AMF dependent.
  - Non-AMF dependent
    - Invasive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

# PMC –Ecotype Seed

- 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

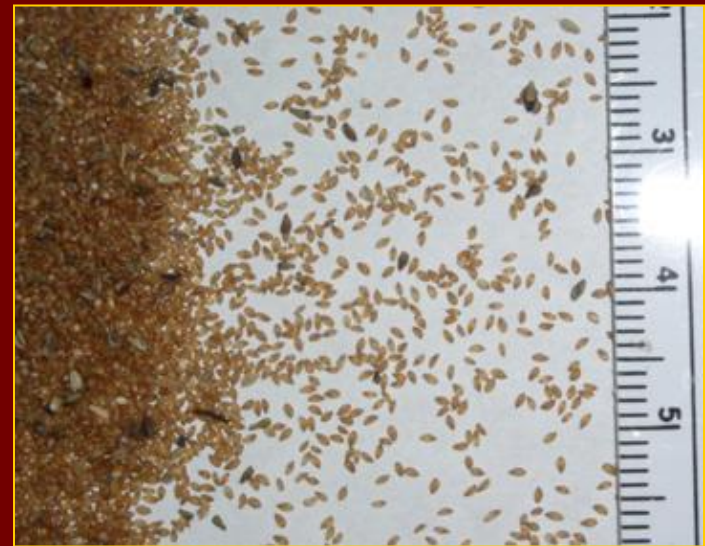
- To obtain desirable traits without breeding
  - Different collections may stand out in vigor, seed production, or active seed germination
  - It may be that no collection has all of the desirable traits
  - Lines can be produced separately, and seed can be blended before sale

# Types of Seed Releases

- Single Accession
- Multi-accession
- Multi-species Blends

# Single Accession Seed Release

- Mariah Germplasm Hooded Windmillgrass
  - *Chloris cucullata*
  - Kenedy County



# Mariah Germplasm Hooded Windmillgrass

- 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

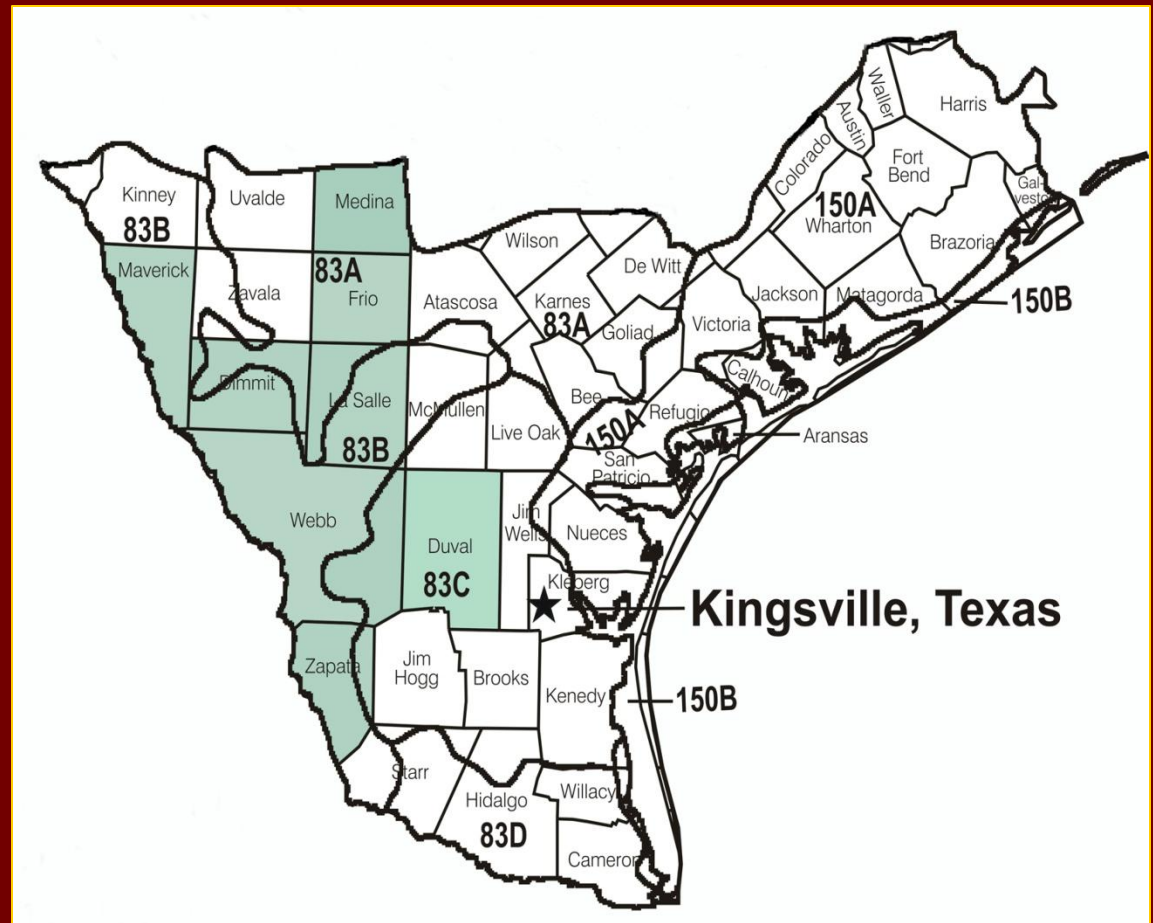
## ■ Characteristics:

- 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

<b>Accession</b>	<b>County</b>	<b>Soil Type</b>	<b>Seed Yield (#/acre)</b>
648	Webb	Clay	108
677	Karnes	Clay	108
819	Bexar	Silty Clay	275
820	Willacy	Fine Sand	544

# Multi-Species Seed Release

- Catarina Germplasm Bristlegrass
  - A mechanical blend of 4 South Texas collections
  - 2 species
    - *Setaria vulpisetata*
    - *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/ft<sup>2</sup> @ 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 seedlings 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)





# *La Semilla*

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