

Matching Appropriate Seed to Conservation Practices

Remnant wet prairie in SC NRCS
Wetland Reserve Program
(WRP is an Agricultural Conservation
Easement Program, ACEP)

Photo: Sudie Daves Thomas

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THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION



- Is seeding appropriate for the best ecological restoration?
 - If not, “daylight” the seed bank
- On the ground examples of planting projects & lessons learned
- Restoring communities
- Seed type & mix considerations
 - Ecotype, source identified, cultivar, PLS...
 - Richness vs. diversity
 - Plant guilds
- New planning tool from Iowa & Georgia
- Considerations when choosing seed for critical areas (stabilization), forage, & wildlife that benefits agriculture
- Additional Resources
- Questions
- Contact information

cordgrass prairie in Iowa





What is the history of the site? Was it previously cultivated?
If not, the **existing seed bank** may be the most appropriate seed source.

Donahue pine flatwood in
South Carolina

*For help determining if planting is appropriate, see Norman Melvin's "decision sequence keys" in *Wetlands Restoration, Enhancement, and Management*
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010838.pdf

Photo: Sudie Daves
Thomas, SC NRCS



Bringing in sunlight by thinning & burning may be the best restoration strategy.

Associated NRCS practices:

- **409** Prescribed Forestry
- **338** Prescribed Burning
- **528** Prescribed Grazing
- **643** Restoration and Management of Rare and Declining Habitats
- **647** Early Successional Habitat Development or Management
- **659** Wetland Enhancement
- **657** Wetland Restoration
- **644** Wetland Wildlife Habitat Management
- **381** Silvopasture Establishment



Carolina Bay in NC restored with thinning & burning

Is seeding the best strategy?

If so, aim to use

- the most local material available
- cultivars adapted to the site that fit the community

Transplanted wiregrass and pitcher plants

Large Flowered Partridge Pea ("Lark" cultivar) planted in former crop fields with native seed mixtures and longleaf pine.



Florence Co., SC

"Wildlife habitat" and "Longleaf understory" plantings



Bamberg Co., SC

With longleaf pine



Seed, Sprigs, or Plants (Variety)	Rate	Total	Germination	Purity
Switchgrass Alamo	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Maximillian Sunflowers Aztec or Prairie Gold	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Partridge Pea	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Indiangrass Rumsey or Newberry	2 lbs PLS	Per acre	> 50% PLS	> 50% PLS

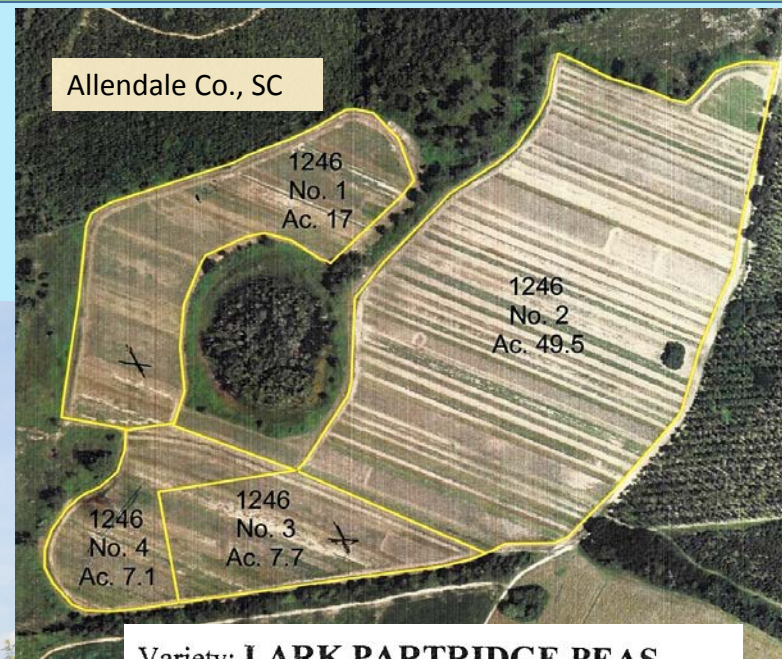
2014/02/21

2014/02/21



Photos: Ben Padgett

Little blue and switchgrass planted at a rate of 2 lbs of pure live seed /ac and the partridge pea was planted at a rate of 1 lb/ac of PLS, between every 4th row of longleaf pine on 74 acres.



Variety: **LARK PARTRIDGE PEAS**

Purity	98.00%
Total Germination	78.00%
Inert Matter	.75%
Weed Seed	.75%
Noxious Weed	None
Other Crop	.50%
Where Grown	AL
Date Tested	01/10
Net Wt. per bag	50 lb.
Lot #	MSF-810



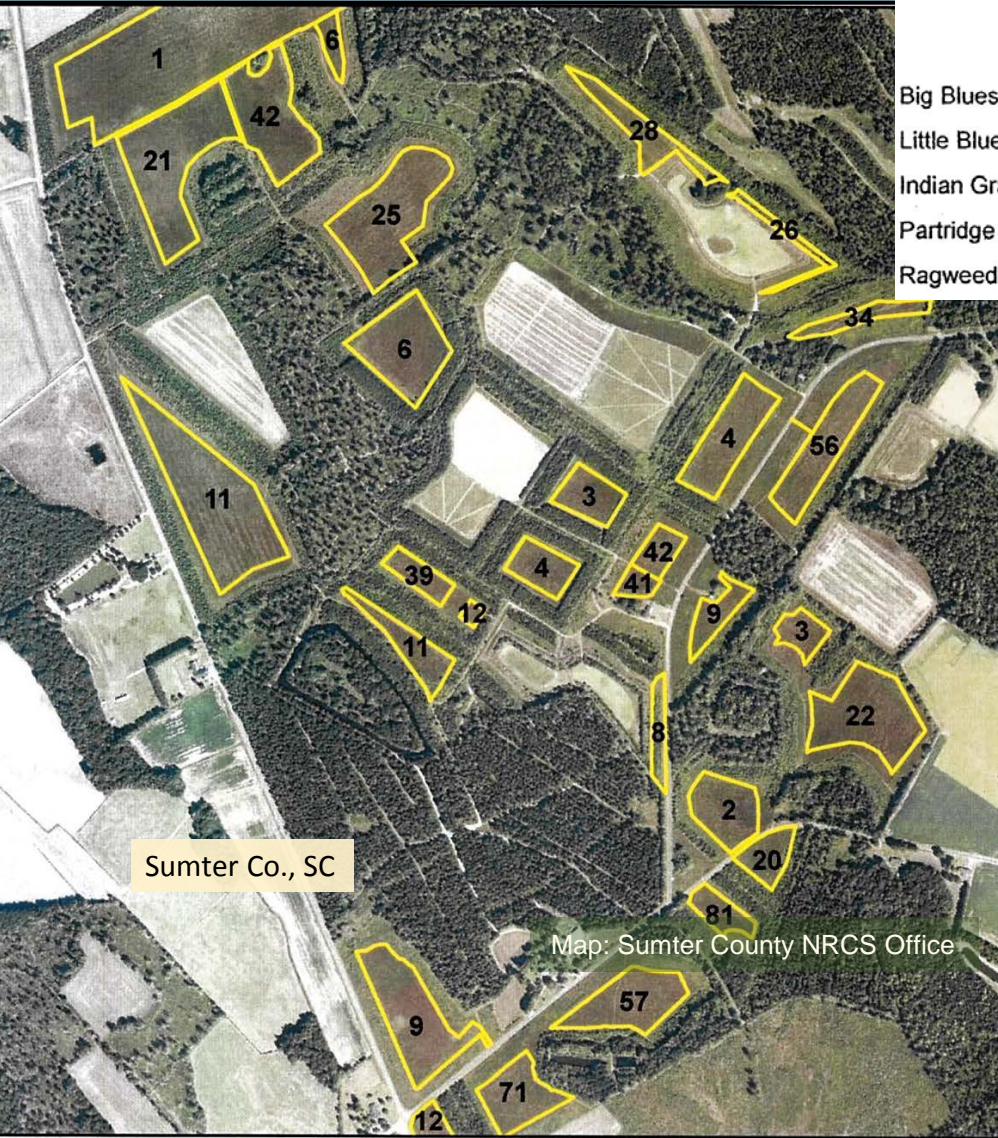
Planting: CRP project with longleaf pine intended to add diversity and restore understory structure for fire fuel and habitat. Thick growth of partridge pea caused mortality of longleaf and has not allowed any other herbaceous species to grow. Longleaf has been spot planted 3 times due to mortality. Attempts to control partridge pea ongoing (mowing twice a year).

CIMARRON LITTLE BLUESTEM

Lot #	28077A	Test Date:	1/09
		Origin:	TX
Pure Seed	57.26%	Germination:	87.00%
Inert	42.33%	Dormant:	0.00%
Other Crop	0.40%	Hard:	0.00%
Weed Seed	0.01%	Total Germination:	87.00%
	Pure Live Seed: 49.82%	Net Wt:	30.lbs
	Noxious Weed Seed Per Pound: NONE		



“Wildlife habitat” planting 127 acres (2 lbs. each of switchgrass, big bluestem, Indian grass, little bluestem, and partridge pea; little is evident besides partridge pea)



	Gross Wt. Shipped	PLS %	PLS Wt. Ordered
Big Bluestem	100.36 lbs	63.77%	64.00 lbs
Little Bluestem	93.95 lbs	68.12%	64.00 lbs
Indian Grass	73.48 lbs	87.10%	64.00 lbs
Partridge Pea	1,276.17 oz.	80.71%	1,030.00 oz.
Ragweed	1,329.72 oz.	77.46%	1,030.00 oz.



How much is too much?



Photos: Sudie Daves Thomas

Recommended seed mix

Seed, Sprigs, or Plants (Variety)	Rate	Total	Germination	Purity
Switchgrass Alamo	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Maximillian Sunflowers Aztec or Prairie Gold	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Black eyed-Susan Indian summer or Golden Jubilee	2 lbs. PLS	Per acre	> 50% PLS	> 50% PLS
Indiangrass Rumsey or Newberry	3 lbs PLS	Per acre	> 50% PLS	.> 50%PLs



Photo: Wilfred Pace



1	CHEYENNE INDIANGRASS 29007A	SHIP	107.7 PLS	\$8.50 /PLS
		76.25%	141 LBS	2 bags at 50#; 1 at 41#
2	BLACKEYED SUSAN 25201A	SHIP	71.8 PLS	\$23.25 /PLS
		78.06%	92 LBS	1 bags at 50#; 1 at 42#
3	MAXIMILIAN SUNFLOWER VARIETY NOT S 27035A	SHIP	71.8 PLS	\$19.00 /PLS
		67.38%	107 LBS	2 bags at 50#; 1 at 7#
4	ALAMO SWITCHGRASS 28111A	SHIP	71.8 PLS	\$10.00 /PLS
		84.96%	85 LBS	1 bags at 50#; 1 at 35#
Seed mix invoice			Total Weight:	424 LBS

Bamberg Co., SC

Photos: Dick Yetter



Switchgrass ("Alamo" cultivar) planted in former crop fields with native seed mixture and longleaf pine (36 acres). Planted between every row of longleaf.

Same seed mix (with Alamo switchgrass) planted at a different site with native seed mixture and longleaf pine. Results are complicated (agricultural history, soil condition, planting methods, etc.)



Similar seed mix (Alamo switchgrass and Lark Partridge Pea with Maximillian Sunflower) planted with native seed mixture, problems with Partridge Pea and Johnson Grass



York Co., SC

Photo: Sudie Daves Thomas



Photos: Sudie Daves Thomas

Pollinator Habitat Plots, Sumter Co. site, CSP	
Species Planted	observed 6-25-14
Little Bluestem	yes, sparse
Black Eyed Susan	yes, abundant
Lance-leaved Coreopsis	yes, scattered
Partridge Pea	yes, abundant
False Sunflower	yes, scattered
Bergamot	yes, abundant
Spiked Blazing Star	yes, sparse
New England Aster	yes, sparse
Iron weed	yes, scattered
Indian Blanket	yes, scattered
Purple Coneflower	yes, scattered
White Wingstem	no

**Small plots, old food plots,
management includes prescribed
fire, diverse species mix used**

Sumter Co., SC

Problem species within pollinator plots (competitive)	
Dog Fennel (native)	abundant
Horseweed (native)	scattered
Vasey Grass (exotic)	patchy

Naturally occurring beneficial native species	
Mistflower	Herb
Goldenrod (several species)	Herb
Anise-scented Goldenrod	Herb
Blue Vervain	Herb
Fleabane Daisy	Herb
Desmodium sp./Beggar's Lice/Ticktrefoil	Herb
Slender Lespedeza	Herb
Velvet Panic grass	Herb
Several other panic grasses	Herb
Creeping Lespedeza	Herb
White Vervain	Herb
Late-flowering Boneset	Herb
Elephant's Foot	Herb
Devil's Walking Stick	Woody
Beauty Berry	Woody



Product	Net Weight Ordered	PLS Weight Ordered	Price per Unit	Total Amount
Little Bluestem		30 lb	\$16.50/PLS lb	\$495.00
Black eyed Susan		3.75 lb	\$26.50/PLS lb	\$99.38
Lance-Leaved Coreopsis		8.75 lb	\$23.00/PLS lb	\$201.25
Partridge Pea		2.5 lb	\$16.50/PLS lb	\$41.25
False Sunflower		8.75 lb	\$34.50/PLS lb	\$301.88
Bergamot		1.88 lb	\$282.00/PLS lb	\$530.16
Spiked Blazing Star		5 lb	\$97.75/PLS lb	\$488.75
New England Aster		2.5 lb	\$312.50/PLS lb	\$781.25
Iron Weed		2.5 lb	\$102.50/PLS lb	\$256.25
Indian Blanket		3.75 lb	\$37.50/PLS lb	\$140.63
Purple Coneflower		8.75 lb	\$34.00/PLS lb	\$297.50
White Wingstem		2.5 lb	\$114.00/PLS lb	\$285.00
Subtotal				\$ 3,918.30
Discount	(Subtotal	\$ 3,918.30 x	%)	

6 acre fescue/bermuda grass field converted to diverse native herbaceous species mix (Edgefield Co., SC)

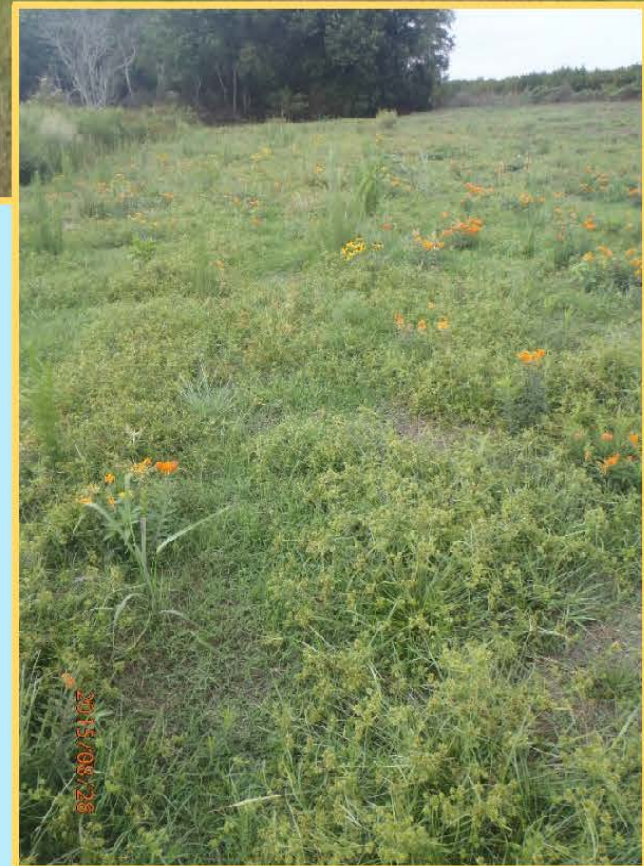


Before

Photos: Sudie Daves Thomas

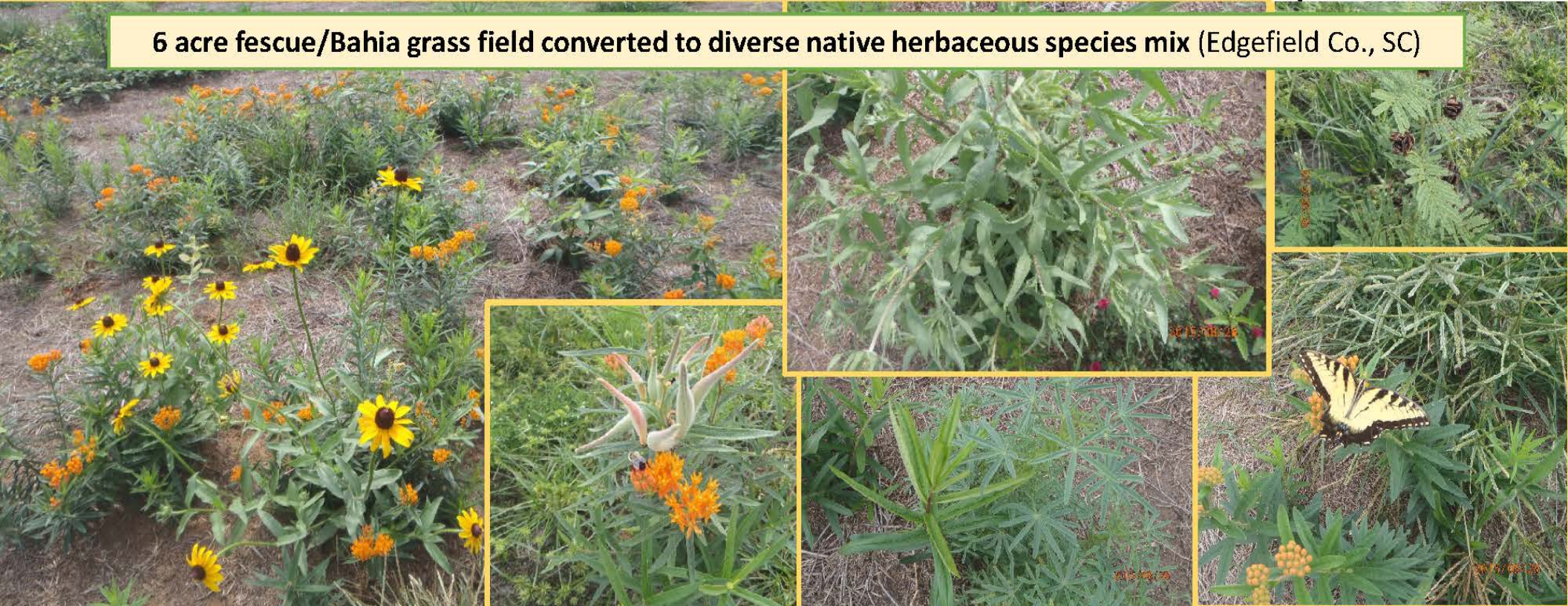


After



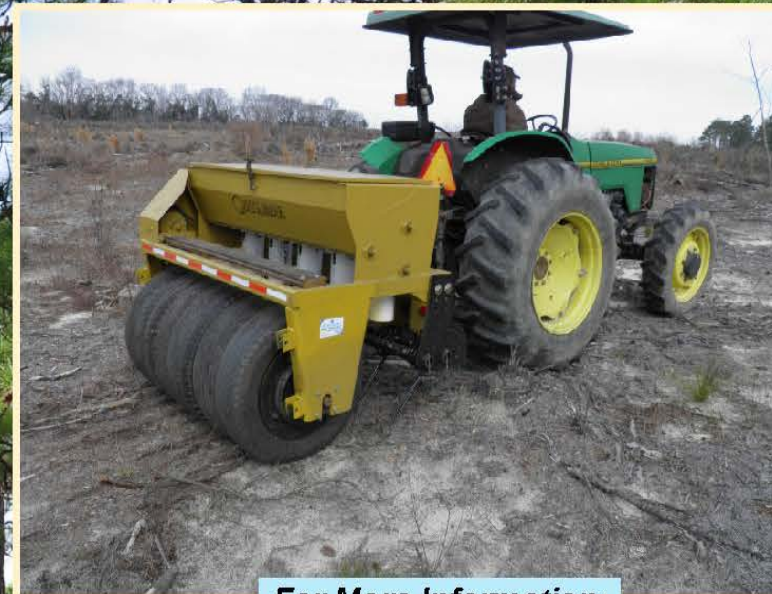
Description	4ac		Net 30
	Qty	Price	Amount
Indian Grass	4	\$20.00 /pls lb	80.00
Little Bluestem	2	\$20.00 /pls lb	40.00
Virginia Wild Rye	4	\$12.50 /pls lb	50.00
Butterfly Milkweed	4	\$298.00 /pls lb	1,192.00
Perplexed Ticktrefoil	2.4	\$40.00 /pls lb	96.00
Wild Blue Lupine	8	\$50.00 /pls lb	400.00
Iron Weed	1.2	\$85.00 /pls lb	102.00
Narrowleaf Sunflower	2	\$72.50 /pls lb	145.00
Hairy Lespedeza	1.2	\$315.00 /pls lb	378.00
Blackeyed Susan	0.4	\$27.00 /pls lb	10.80
Freight - UPS	1	\$30.35 /unit	30.35

6 acre fescue/Bahia grass field converted to diverse native herbaceous species mix (Edgefield Co., SC)





Sandhills
Longleaf Pine Conservation
Partnership



For More Information:

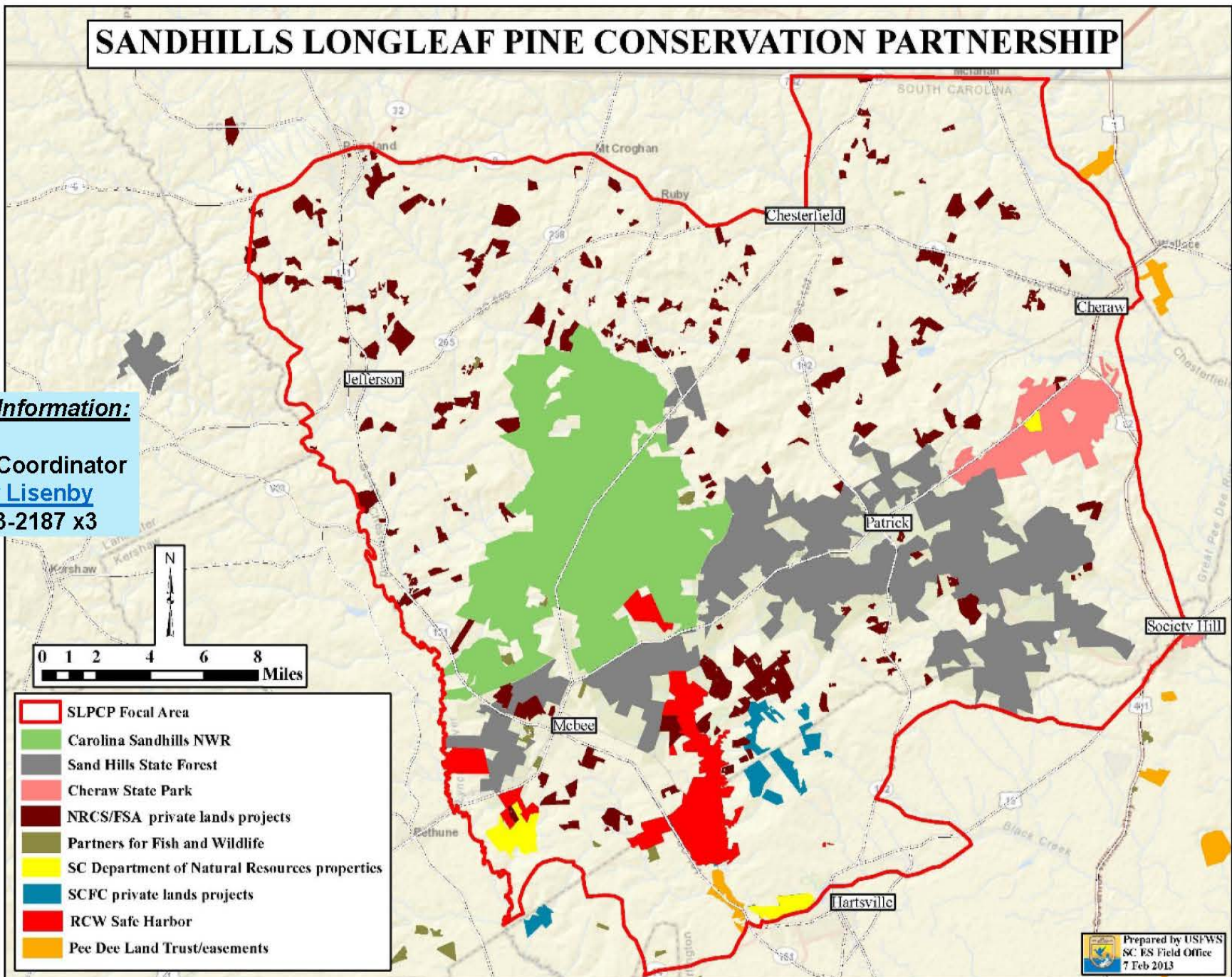
Longleaf Coordinator
[Jimmy Lisenby](#)
843-623-2187 x3



SANDHILLS LONGLEAF PINE CONSERVATION PARTNERSHIP

For More Information:

Longleaf Coordinator
[Jimmy Lisenby](#)
843-623-2187 x3



When planning seeding projects to benefit pollinators, wildlife, or to increase diversity; consider potential impacts on rare species.
Some investigation may be in order.



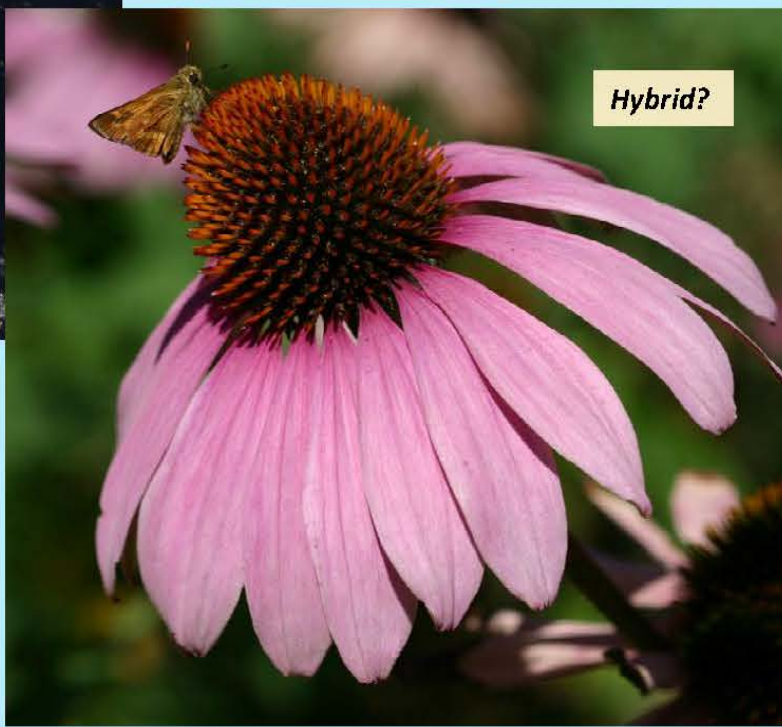
E. purpurea

At the SC Botanical Garden (Clemson University), these species have apparently hybridized and concerns have arisen about polluting the genetics of the rare Smooth Coneflower.



Echinacea laevigata (Smooth Coneflower) occurs naturally in SC and NC in a few sites. The species is listed as Federally Endangered and tracked by the USFWS.

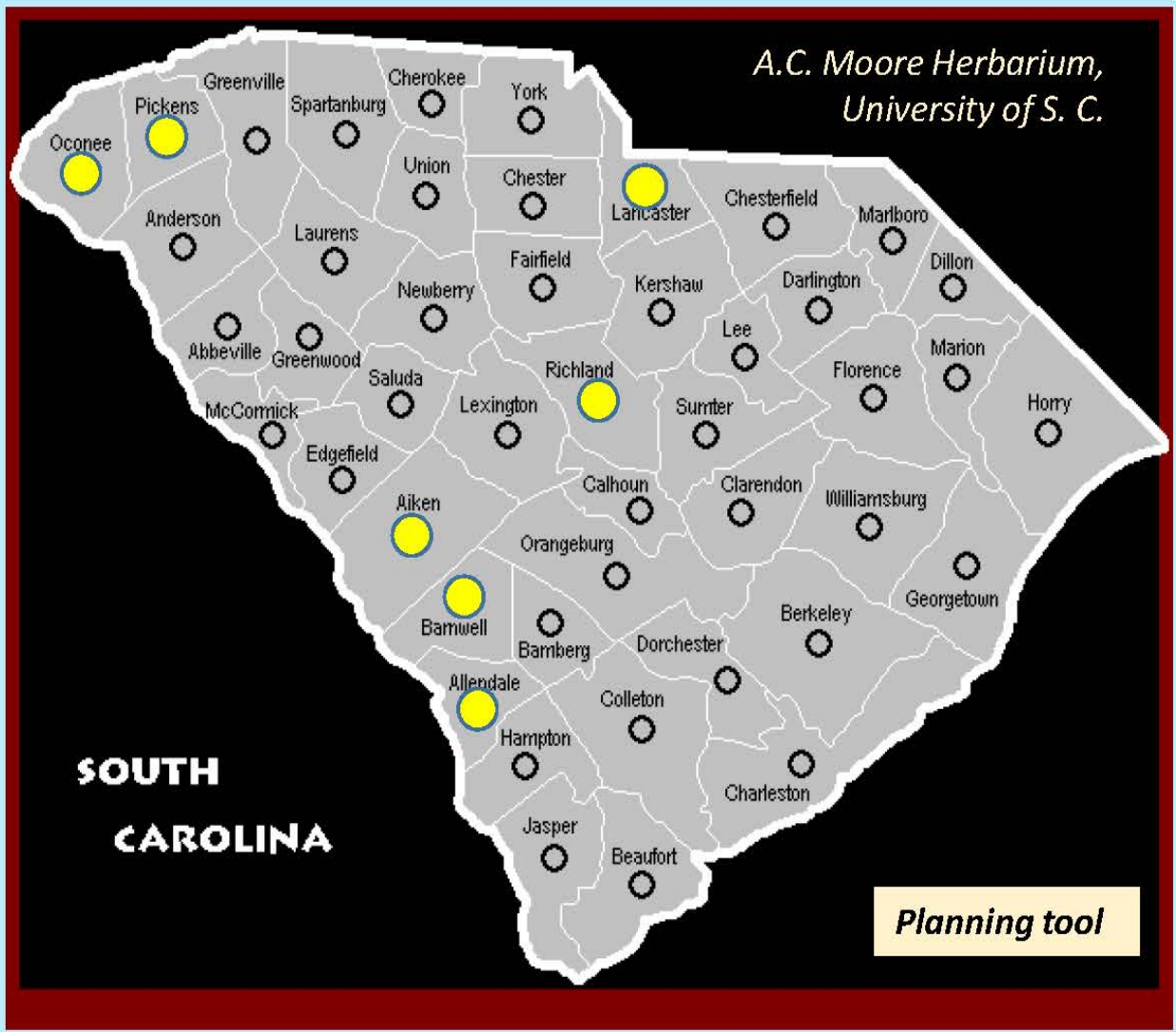
E. laevigata



Hybrid?

Echinacea purpurea (Purple coneflower), along with its many varieties, is planted widely in gardens and for pollinators but range does not include much of Southeast. Seed is economical and abundant because it is a great species for restoration of mid-western prairies, it generally establishes and grows well, and is beneficial to pollinators.

Echinacea laevigata [smooth coneflower] Range Map S.C.



“Essentially we have found that having *Echinacea purpurea* and *teneseensis* within the cruising range of *E. laevigata* (up to .5 mile from them) has resulted in the production of apparent hybrids. This is a great reason to avoid the introduction of common purple coneflower (and varieties) within cruising range of smooth coneflower. “

Population of *E. laevigata* was established at edge of the Botanical Garden for study around 2000. Seeds were originally collected from wild population. Seeds used from Bot Garden population were grown out and planted elsewhere in garden, subsequent generations showed characteristics of *E. purpurea* and *E. tenneseensis*, which can be found planted around Clemson University Campus. All plants have been removed.

herbarium.biol.sc.edu	
<i>Echinacea laevigata</i> (C.L. Boynt. & Beadle) Blake	• map
<i>Echinochloa colona</i> (L.) Link	• map
<i>Echinochloa crus-galli</i> (L.) Baeuv.	• map

Echinacea purpurea is not officially recorded in S. C. (S. C. Plant Atlas)

- Patrick D. McMillan, PhD Curator
Clemson Herbarium, Director S. C. Botanical Garden at Clemson University



SYNONYMS CLASSIFICATION LEGAL STATUS RELATED LINKS

GENERAL IMAGES SYNONYMS CLASSIFICATION LEGAL STATUS RELATED LINKS

(L. Boynt. & Beadle) S.F. Blake
Flower

Echinacea purpurea (L.) Moench
eastern purple coneflower

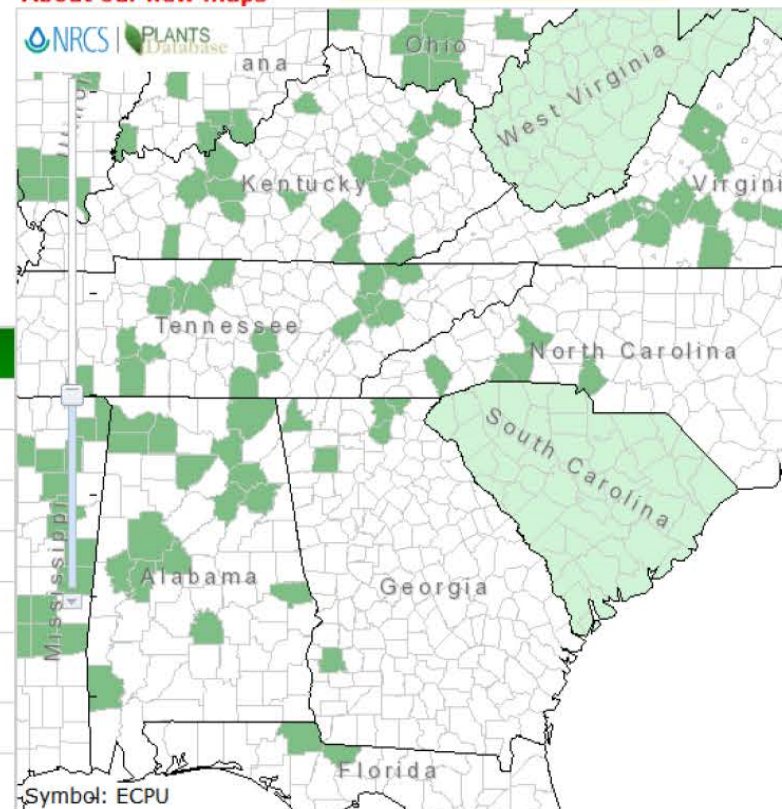
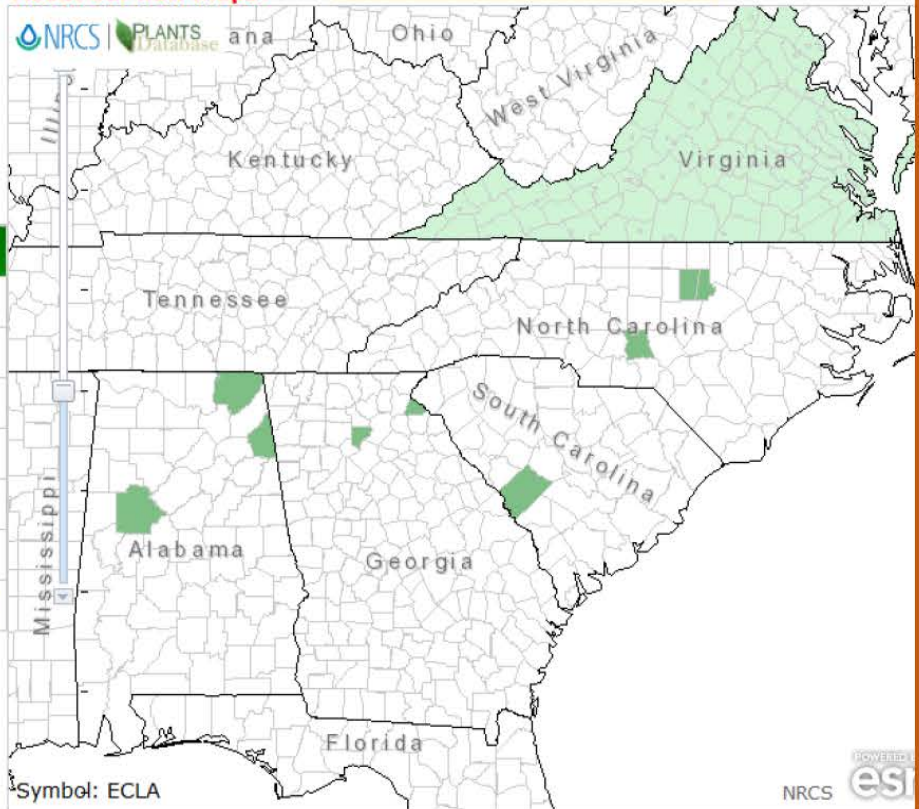
E. laevigata

E. purpurea

Show All

About our new maps

About our new maps



Legend for *E. laevigata*:
 Green: Native
 Light Green: Native, No County Data
 Blue: Introduced
 Light Blue: Introduced, No County Data
 Brown: Both
 Light Brown: Both, No County Data
 White: Absent/Unreported

Legend for *E. purpurea*:
 Green: Native
 Light Green: Native, No County Data
 Blue: Introduced
 Light Blue: Introduced, No County Data
 Brown: Both
 Light Brown: Both, No County Data

Native Status:
 L48 AK HI PR VI NAV CAN GL SPM

Native Status:
 L48 AK HI PR VI NAV CAN GL

General Information

Symbol:	ECPU
Group:	Dicot
Family:	Asteraceae
Duration:	Perennial
Growth Habit:	Forb/herb
Native Status:	CAN I L48 N

Characteristics

[Fact Sheet \(pdf\) \(doc\)](#)
[Plant Guide \(pdf\) \(doc\)](#)

Data Source and Documentation

Facilitate understanding of available species, seed sizes, planting rates, bloom time, site requirements, cost, and generate jobsheet/specifications

Native Species Mixes and Cost Estimator (reduce spreadsheet size to 80-85% see more of spreadsheet)		Species names with * = preferred by Monarchs							
Use this calculator for seed sold on PLS basis or all species have viability >80% (check with vendor). If some species have viability <80%, use the Bulk Calculator and Specifications tabs or click below...									
If some species have viability <80%, CLICK HERE									
SEEDED Species in Mix (Click on cell in column A to use pull down menu to select)		Estimated \$/lb	Seed/lb	Enter desired lb/A in mix Adjust as needed	Seed/acre	% of Mix		Flowering Period	
Aster, Eastern Showy (NC ecotype)*	<i>Aster spectabilis / Eurybia spectabilis (NC)</i>	240	1,200,000	0.08	96,000	5%		sum fall	
Coneflower, Purple *	<i>Echinacea purpurea</i>	30	154,221	0.80	123,377	7%		sum	
Wild Blue Lupine* (legume)	<i>Lupinus perennis</i>	60	16,000	5.00	80,000	5%	sprg		
Mint, Clustered Mountain*	<i>Thymus praecox / Thymus serpyllifolius</i>	200	3,500,000	0.05	175,000	10%		sum	
Mint, Clustered Mountain*	<i>Trisetis graminifolia / L. pilosa (NC)</i>	200	173,000	0.60	103,800	6%		sum	
Mint, Hoary Mountain*	<i>Aster laterifolius / Symphyotrichum lateriflorum</i>	220	800,000	0.20	160,000	9%		sum fall	
Mint, Lemon	<i>Madia erecta</i>	230	1,300,000	0.08	104,000	6%		sum fall	
Mint, Ohio / Downy Pagoda (NC ecotype)	<i>Thalictrum flavum / Thalictrum flavum</i>	30	154,000	0.70	107,800	6%	sprg	sum fall	
Mint, Slender Mountain*	<i>Thalictrum flavum</i>	125	90,000	1.00	90,000	5%		sum	
Mint, Spotted Bee Balm* (SC, NC ecotypes)	<i>Thalictrum flavum</i>	60	75,000	1.80	135,000	8%		sum fall	
Mint, Wild Bergamot*	<i>Cassia nictitans / Chamaecrista nictitans</i>	18	160,000	0.60	96,000	5%	sprg	sum	
Monkey Flower	<i>Asclepias tuberosa</i>	320	70,000	1.00	70,000	4%		sum	
Partridge Pea-Small Flowered* (legume)	<i>Gaillardia pulchella</i>	35	223,300	0.80	178,640	10%	sprg	sum fall	
Coreopsis-Largeflower Tickseed* (GA ecotype)	<i>Schizachyrium scoparium (Andropogon scoparius)</i>	30	260,000	0.40	104,000	6%			
Milkweed, Butterfly *	<i>Elymus canadensis</i>	12	83,200	1.50	124,800	7%			
Indian Blanket/Blanketflower, Annual*									
Bluestem, Little (grass) -NC ecotype									
Wild Rye, Canada (grass)									
scroll down to add woody plants(trees, shrubs, vines) beneficial for pollinators and wildlife		Clear Data		Seed per Sq Ft (for pollinators needs to be between 40-60, for longleaf restoration or wildlife between 25-30):				40.1	REGIONS: CP=Co All=statewide
				Total Lb per Acre of Mix Planted:				14.6	Once you ha
				Seed cost estimate per acre of mix:				\$1,178.40	

It's More Than a Planting, Restore Communities!

No:



No:



Yes:



Yes:



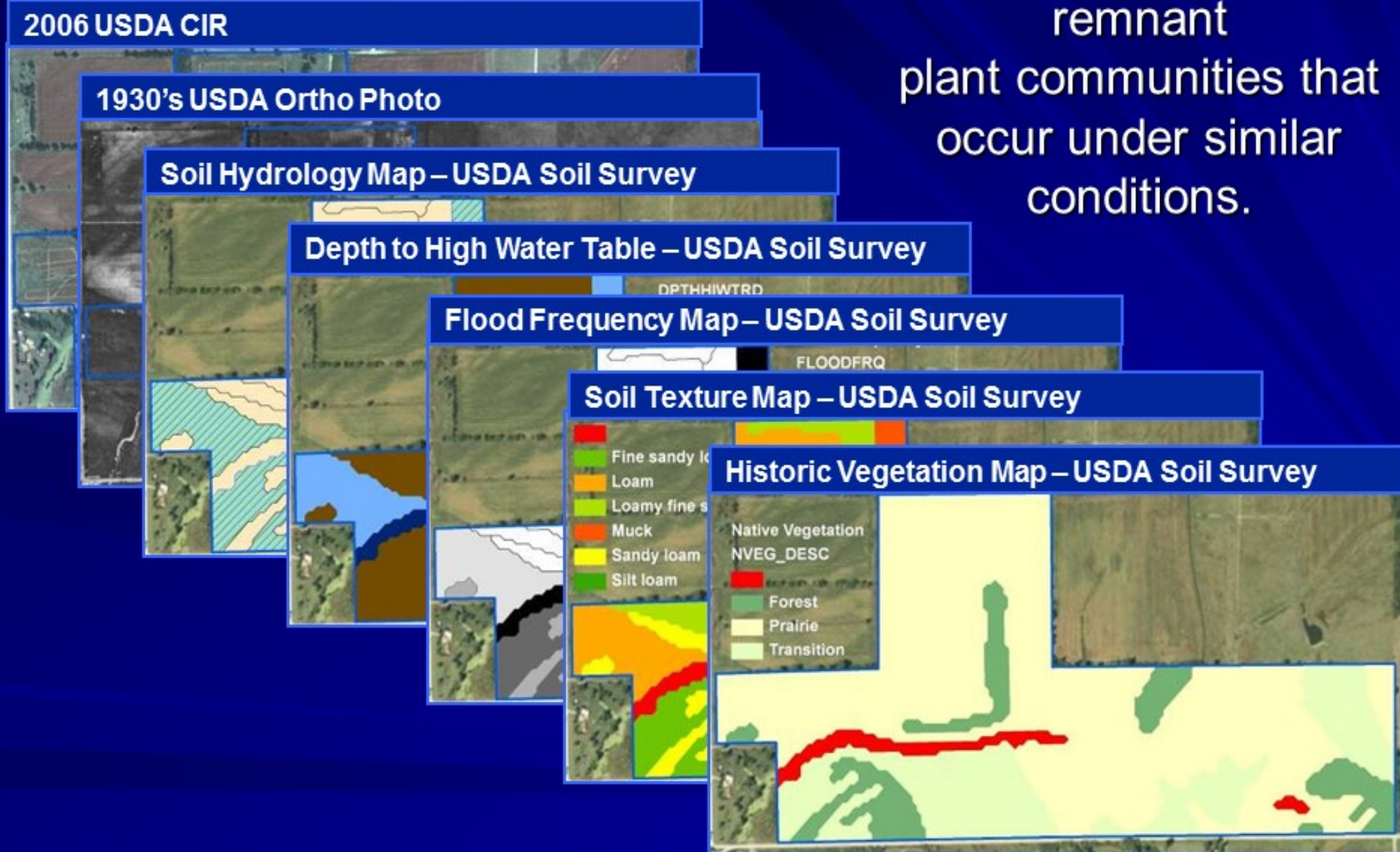
Yes:



Communities:

- ⦿ Communities - population assemblages of many species living and interacting in close proximity to one another.
- ⦿ Communities don't adapt and migrate, species do.
 - Results in the inability to exactly replicate a reference community
- ⦿ Focus should be on restoring representative community composition and structure, not single species.
 - species-specific (plant or animal) approaches are more appropriate when prescribing/implementing management within a suitable community type (i.e. habitat).

Research site conditions
and find high-quality
remnant
plant communities that
occur under similar
conditions.



Use restoration tools like the Iowa NRCS Native Plant Community Database
to aid in community selection.

Ecotype Plant Materials

- Characteristics are not distributed randomly throughout a species range
 - clustered into ecological regions (ecoregions)/ seed transfer zones/provenances.
 - Vary in soil type, elevation, exposure, seed dispersal mechanisms, moisture & hydrology, etc.
 - Plants within these ecological regions are known as **ecotypes**.
- Individual species having a large geographical distribution vary considerably in such characteristics as
 - plant height
 - growth habits
 - maturation dates
 - leaf appearance
 - reproductive habits

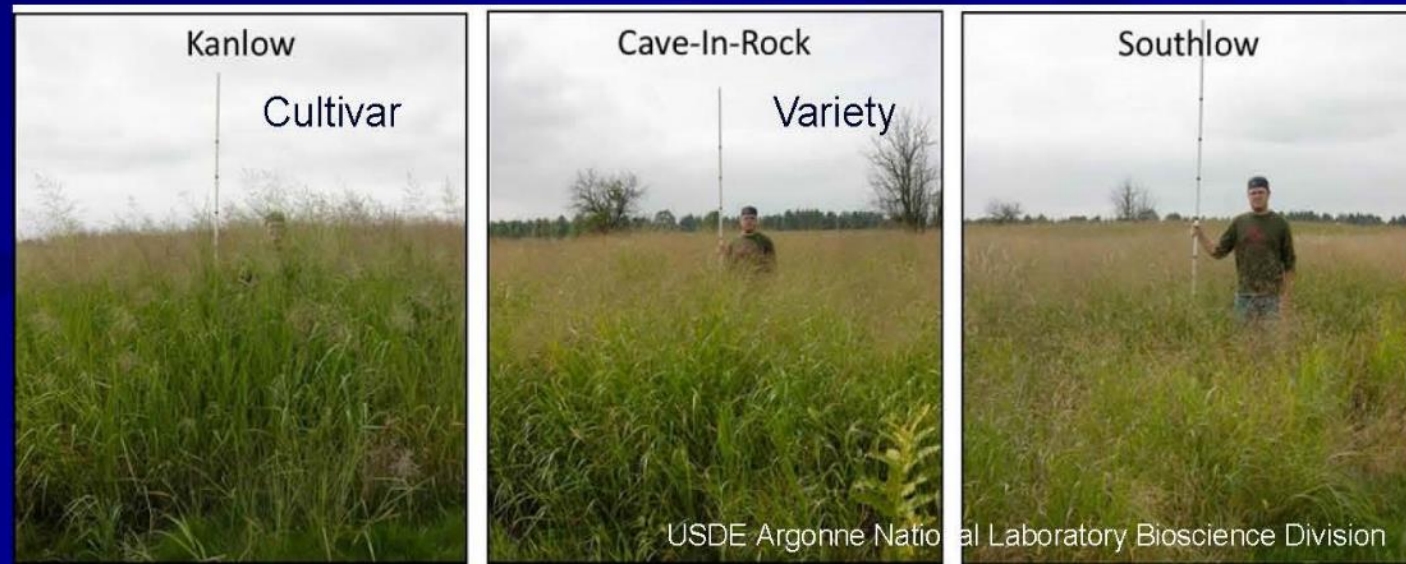
Beyond Ecotypes: Source Identified

- No anthropogenic genetic manipulation or selection
- Greater genetic compatibility with local, remnant populations
- Better establishment success
- Bloom synchronization with local fauna and pollinators
- Greater pest and disease resistance
- Greater resistance and resilience to natural disturbance
 - long-term persistence
- Less likely to become an invasive pest

Cultivar, Tested, and Selected Releases

- Bred to behave consistently and uniformly
- Typically selected to exhibit improved characteristics for a minimum
- Can be overly competitive within ecological restorations.
- Can pose genetic pollution concerns.

number of generations




Pure Live Seed (PLS)

All NRCS recommendations are expressed in pounds of pure live seed (PLS). PLS is defined as the percentage of pure seed that will germinate expressed as a percentage of a given weight of seed. It provides a common basis for comparing seed lots that differ in purity and germination.

How to calculate:

PLS = (percent purity × percent total germination (germination+hard)) x100

Bulk seeding rate /acre =Lbs PLS recommended rate per acre/ Percent PLS



Crop/Species: <i>Elymus virginicus</i> / Virginia wildrye		
Lot Number: SG0-02-F12		
Test Date: 12/5/02	Pure Seed: 72.66%	
Germination: 70%	Inert: 27.22%	
Hard Seed: 17%	Other Crop: 0.06%	Origin: Field 12 PMC
Total Viability: 87%	Weed Seed: 0.06%	Year Grown: 2002
TZ Tested: No	Noxious Seed: 0%	
PLS: 63.2142%	Net Weight: 8 #	
Labeled by USDA-Natural Resource Conservation Service		
Eisberry Plant Materials Center		
Frc		

Example based on a recommended PLS seeding rate of 2lbs/acre for *Elymus virginicus*:

$$\text{PLS} = (0.7266 \times (0.70 + 0.17)) \times 100 = 63.2142\%$$

$$\text{Bulk seeding rate/ac} = 2\text{lbs} / 0.632142 = 3.16 \text{ bulk lbs/acre}$$

Species Richness

- Total number of species represented in the seeding mix.

<u>Community 1</u>	<u>Community 2</u>
Species A	Species A
Species B	Species B
Species C	Species C
Species D	Species D
<u>Species Richness</u>	
4	4

Species Diversity

- Total number of species (species richness) and their abundance in the seeding mix.

<u>Community 1</u>	<u>Community 2</u>
Species A = 25	Species A = 80
Species B = 50	Species B = 10
Species C = 10	Species C = 7
Species D = 15	Species D = 3
<u>Evenness</u>	
87%	50%

Diverse Seeding Mixtures

- High Species Richness
 - ≥ 10 grasses
 - ≥ 20 forbs
- Community-listed Dominant and Co-dominant species must be represented in the mix
- Functional groups that may occur in reference communities and should be represented in respective seeding plans:
 - Annual & Biannual forbs and graminoids
 - Perennial forbs & graminoids
 - Warm and cool season graminoids
 - Tall, mid, and short height classes of forbs and graminoids
 - Ferns and Fern Allies
 - Legumes
 - Hemiparasitic plants
 - Woody and herbaceous Vines
 - Shrubs and subshrubs
 - Trees



Balanced Seeding Mixtures

- Theoretically, seed mixes should be as even as possible
 - A 20 graminoid seeds/ft² and 20 forb seeds/ft² mix, minimum 5 grasses and 10 forbs
 - use 4 seeds/ sq ft for each grass species and 2 seeds/sq ft for each forb species
- Research has found that rare or under-represented species in uneven seed mixes go extinct on the site within several years.
- More aggressive species may need to be seeded at a lower rate.
 - Research indicating that reducing the larger, more aggressive grasses to less than 4 seeds/ft² will result in more diverse restorations with a greater forb component.

Conservatism Guilds

- All conservatism guilds should be represented
 - Colonizing 15-33% of mix
 - Matrix 45-65% of mix
 - Conservative 15-33% of mix
- It is important to have the colonizing guild represented to fill gaps after disturbances.
 - Otherwise, disturbance may increase stand vulnerability to invasion.
- Data suggests that increasing seeding rates (density) reduces susceptibility to invasion.

Example Seed Mixes

- A comparison of three 20:20 seed mixes of differing Species Richness (evenness = 100%):
 - 5 graminoid and 10 forb
 - Cost/ac = \$901 FQI = 16.3 CC = 4.2
 - 10 graminoid and 20 forb
 - Cost/ac = \$747 (\$154) FQI = 26.5 (10.2) CC = 4.8 (0.6)
 - 15 graminoid and 30 forb
 - Cost/ac = \$684 (\$217) FQI = 33.4 (17.1) CC = 5.0 (0.8)
- Species Richness of a mix is not always positively correlated with cost.
- Species Rich mixes have significantly greater integrity.
- Rare, less competitive species are more likely to persist in the long-term.

Germination Requirements

- Typical germination requirements:
 - Cold moist conditions
 - Warm moist conditions
 - Alternating cold and warm moist conditions
 - Light
 - Scarification

- Determine how and when you plant:
 - No-till drill vs. broadcast seeding
 - Dormant (temps below 55° F) vs growing season
 - Split seeding

J. Anderson Cruz



Tools Being Adapted for GA:

Native Plant Community Query, Community Descriptions, and a Native Seeding Calculator


Iowa Native Plant Community Query Database Version 3

Click on the button below to enter the soil characteristics for your query. You will match the text in the soil surface texture, soil drainage class, and soil parent material boxes below.

[Click here to begin your query](#)

Soil Surface Texture Options

Clay
Clay Loam
Fine Sand



Central Cordgrass Wet Prairie

Site Characteristics: Stands occur on lowland areas that are flooded in spring and saturated for much of the growing season. The soils are typically deep, fine-textured, poorly drained, and have high organic content. On some sites there is an impermeable subsurface layer that impedes soil drainage. Stands of this wide-ranging alliance are found on level to gently sloping sites with sand, loam, or clay soils. Wet sand prairies may be more acidic and more likely to become dry in summer; however, floristic characteristics that reflect those factors are not known. Stands may occur near lakes or rivers or in depressions. Locations supporting this alliance are sometimes slightly - moderately alkaline areas along ephemeral, intermittent or perennial streams, and on the margins of large river floodplains. This alliance can also be found in swales, meadows, and on the sites are typically flooded for part of the winter and spring. Soil water movement is rapid enough to preclude the accumulation of salts in the surface horizon.

Vegetation Characteristics: A dense layer of graminoids dominates this community. Forbs (mainly 60% cover) and small trees or shrubs are also common. The vegetation is typically 1-2 m tall. Canada Bluejoint and Prairie Cordgrass are the two most abundant species. Several common Sedge species (*Carex* spp.) found in this community include Common Lake Sedge, Water Sedge, Woolly Sedge, and Hairy-leaved Lake Sedge. Other species that occur with less frequency in this community include Big Bluestem, New England Aster, Wild Strawberry, Northern Bedstraw, Saw-tooth Sunflower, Blue Flag Iris, Prairie Blazing Star, Winged Loosestrife, Cowbane, Switchgrass, Virginia Mountain Mint, Smooth Goldenrod, Purple Meadow-rue, and Culver's root.

Range: G3 - Vulnerable

Conservation Status: G3 - Vulnerable

Management Considerations: Periodic prolonged flooding and fire prevent woody vegetation from dominating this community. Prairie Cordgrass is an early colonizer of suitable habitat and is tolerant of Codgrass have high production rates, however the rough-edged leaves make for poor forage quality, and tall height and thick growth provide shade and cover for wildlife and certain bird species.

Seeding Plan

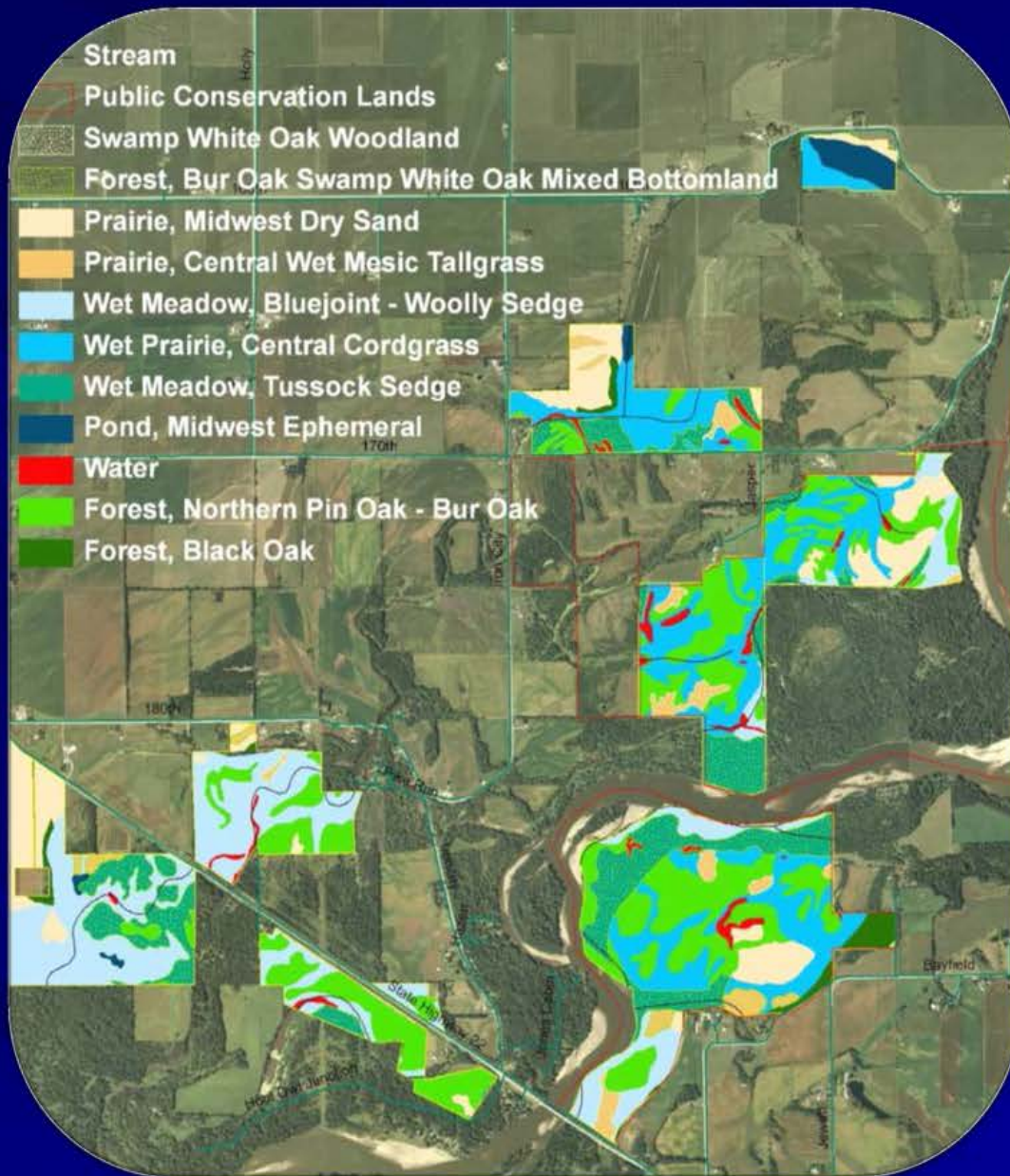
USDA NRCS

Name: Jennifer Anderson-Cruz
Prepared by: John Doe
Type of Seeding: WRP
Field Area (acres): 20.000

IA - CPA - 4 REV February-98 (File Code 180-12-12)
Date: 1/20/2015
Tract No: 1563
Field No: 2
Contract No: 2

Grasses	Scientific Name	Common Name	PLS Lbs/Acre	PLS Lbs	Estimated Cost
1	<i>Calamagrostis canadensis</i>	Bluestem	0.023	0.39	\$145.85
2	<i>Carex elatior</i>	Wheat Sedge	0.12	0.47	\$180.17
3	<i>Carex stricta</i>	Bebb's Sedge	0.019	0.15	\$217.80
4	<i>Carex acuticarpa</i>	Hairyfruit Sedge	0.049	0.39	\$73.37
5	<i>Carex pedunculata</i>	Woolly Sedge	0.026	0.82	\$175.02
6	<i>Carex pedunculata</i>	Broom Sedge	0.17	0.51	\$98.01
7	<i>Carex acuticarpa</i>	Fox Sedge	0.018	3.30	\$229.71
8	<i>Carex vulpinoidea</i>	Fowl Mannagrass	0.018	0.68	\$297.00
9	<i>Glyceria striata</i>	Prairie Cordgrass	0.0034	9.40	\$2,017.34
SUBTOTAL GRASSES					\$43.56
Forbs & Legumes					
1	<i>Asclepias tuberosa</i>	Swamp Milkweed	0.057	1.13	\$204.19
2	<i>Eupatorium perfoliatum</i>	Boneset	0.017	0.34	\$102.09
3	<i>Erigeron philadelphicus</i>	White Wild Indigo	0.015	0.32	\$95.09
4	<i>Bidens alba</i>	Nodding Beggartick	0.065	0.59	\$155.57
5	<i>Chelone glabra</i>	White Turtlehead	0.030	3.83	\$355.11
6	<i>Eryngium yuccifolium</i>	Rattlesnake Master	0.00097	0.019	\$326.70
7	<i>Galium boreale</i>	Northern Bedstraw	0.018	0.36	\$8.75
8	<i>Helianthus grosseserratus</i>	Saw-tooth Sunflower	0.068	1.36	\$163.35
9	<i>Impatiens sibirica</i>	Blue Flag	0.46	9.13	\$204.19
SUBTOTAL FORBS					\$1,800.94
Woody			PLS Lbs / Acre	PLS Lbs	Estimated Cost
1	<i>Amorpha fruticosa</i>	False Indigo	0.0072	0.15	\$92.10
TOTAL			0.93	18.67	\$3,771.84

What You Get for the Extra Effort:



Implementing the ecological restoration approach outlined in this presentation could result in this 703 ha. restoration complex being restored to 11 native plant communities, 195 species, and 11 functional plant groups with an overall floristic quality index of 73.7 and community similarity to nearby remnants. Furthermore, 75% of the complex would be restored to imperiled plant community types.

Comparatively, this is a 680% increase in species richness, a 120% increase in functional diversity, and a 241% increase in floristic quality over the restoration mixes actually seeded within this complex, which did not resemble nearby remnants.

Quick establishment is key

Choose seed with proven establishment success

'Cape' American beachgrass for dune stabilization (critical area)—one of many Conservation Plant Releases from the Plant Materials Program



'Cape' American beachgrass *Ammophila breviligulata*

http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/njpmcrb12116.pdf

Photos of additional Conservation Plant Releases from the Plant Materials Program:

<http://www.nrcs.usda.gov/wps/portal/nrcs/phreleases/plantmaterials/technical/cp/photo/>

Technology Application: Red River Germplasm prairie cordgrass (*Spartina pectinata*) released by Bismarck, ND Plant Materials Center in 1998



http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/ndpmcrb11300.pdf



Red River Germplasm prairie cordgrass

- Excellent habitat for wildlife that inhabits riparian areas.
- Important for
 - Soil stabilization
 - Improving water quality.

Cooperative study: Kingsville TX Plant Materials Center & South Texas Natives project.

Native seed & plant goals

- Native seed for rangeland—
restore plant diversity for wildlife
in degraded habitats
- Restore native plant communities
 - former crop lands
 - land long-dominated by exotic
grasses where native seed banks
depleted
- Prevent the use of invasive
exotic grasses which degrade
wildlife habitat quality



horny toad &
bearded dalea,
Dalea pogonathera

<http://www.ckwri.tamuk.edu/research-programs/south-texas-natives/native-plant-list/>

Goliad Germplasm orange zexmenia (*Wedelia texana*)



- food source for butterflies
- forage for deer and other mammals
- seed eaten by grassland birds
- hosts beneficial insect populations



Zapata Germplasm Rio Grande clammyweed (*Polanisia dodecandra* ssp. *riograndensis*)

- forage for deer and other mammals
- seed eaten by grassland birds
- hosts beneficial insect populations



Catarina blend of perennial bunchgrasses: plains bristlegrass (*Setaria vulpisetata*) and streambed bristlegrass (*Setaria leucopila*)

- provide nesting cover to grassland birds
- seed eaten by wildlife, including bobwhite quail and Rio Grande wild turkey





Is seeding appropriate?

If so, quick establishment & palatability are key



Some common warm season native grasses in the southeast

- splitbeard bluestem, *Andropogon ternarius*
- deertongue, *Dichanthelium* spp.
- Indian grass, *Sorghastrum nutans*
- purple lovegrass, *Eragrostis spectabilis*



Managed grazing can help restore degraded pastures

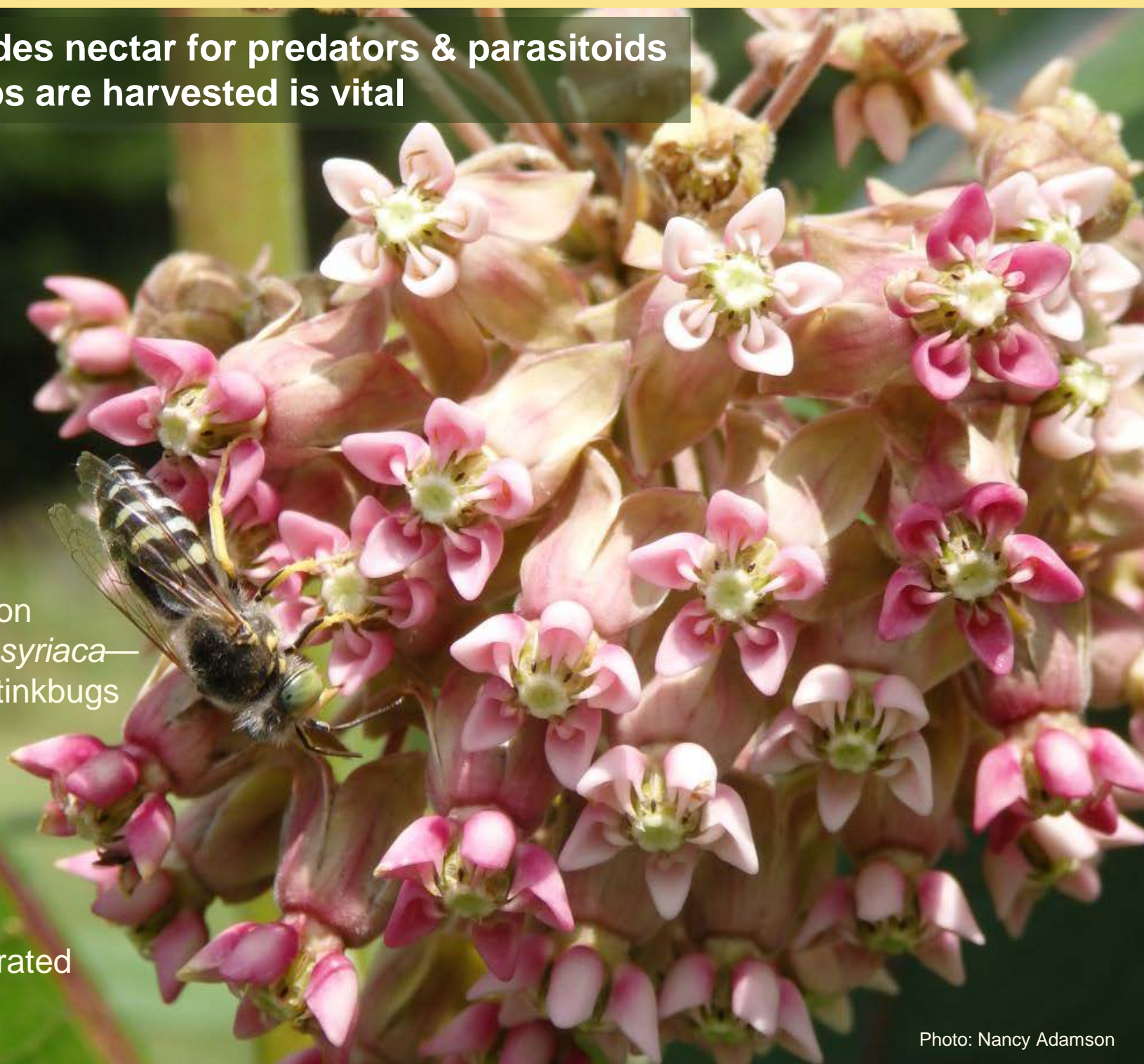
- Managed intensive rotational grazing helps
- Restore plant roots & soil health
 - Support beetle populations that help break down cowpies and return nutrients to soil
 - Forbs reestablish from seed bank
 - Reduce weed problems

Links to resources on managed & winter grazing (stockpiling) in additional resources



Refuge that includes nectar for predators & parasitoids when annual crops are harvested is vital

sand wasp on common milkweed, *Asclepias syriaca*— sand wasps collect stinkbugs to feed their young



*IPM stands for Integrated Pest Management



Diversity & blooms through the season are vital

Choose seed to fill gaps in bloom periods & provide specific nutrients or shelter

Sunflowers, *Helianthus* spp., provide excellent pollen, nectar, and oil-rich seeds that benefit diverse wildlife, including fall migrants.

Legumes like partridge pea, (*Chamaecrista*), bush clover (*Lespedeza*), tick trefoil (*Desmodium*) are rich in protein.

sweat bee on sunchoke
Helianthus tuberosus



Grasses are vital in fire adapted communities as fine fuel. They shelter groundnesting birds, bumblebees, and other wildlife. They are host plants for larvae of grass skippers and some true butterflies.



gemmed satyr
Enodia anthedon

Gemmed satry larvae (caterpillars) eat river oats, *Chasmanthium* spp.



Many plant communities require periodic disturbance—fire, grazing, or mowing—to thrive. Some seed needs fire (smoke) to germinate.



NCTREX team burning a longleaf pine
savanna, February 2015



With growing interest in ecological restoration, particularly using local ecotypes, more regionally local seed is becoming available every day.



sachem pair on American basketflower,
Centaurea americana, in Texas, an
annual native plant newly available in
the seed trade

The Plant Conservation Alliance, consortium of public and private organizations and individuals working to conserve native plants <http://www.nps.gov/plants>.



Natural Resources Conservation Service

Technical and financial assistance for conservation



Photo: Buz Koot



Contact your local NRCS District
Conservationist: www.nrcs.usda.gov.

SC NRCS
restoration
planting

The most long lasting and resilient plantings are inspired by natural communities



gulf fritillary butterflies nectaring on chaffhead, *Carphephorus bellidi*, in SC as they migrate

Photo: Nancy Adamson

Thank you!

Questions?

long-horned bee
on lanceleaf coreopsis,
Coreopsis lanceolata

Photo: Nancy

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