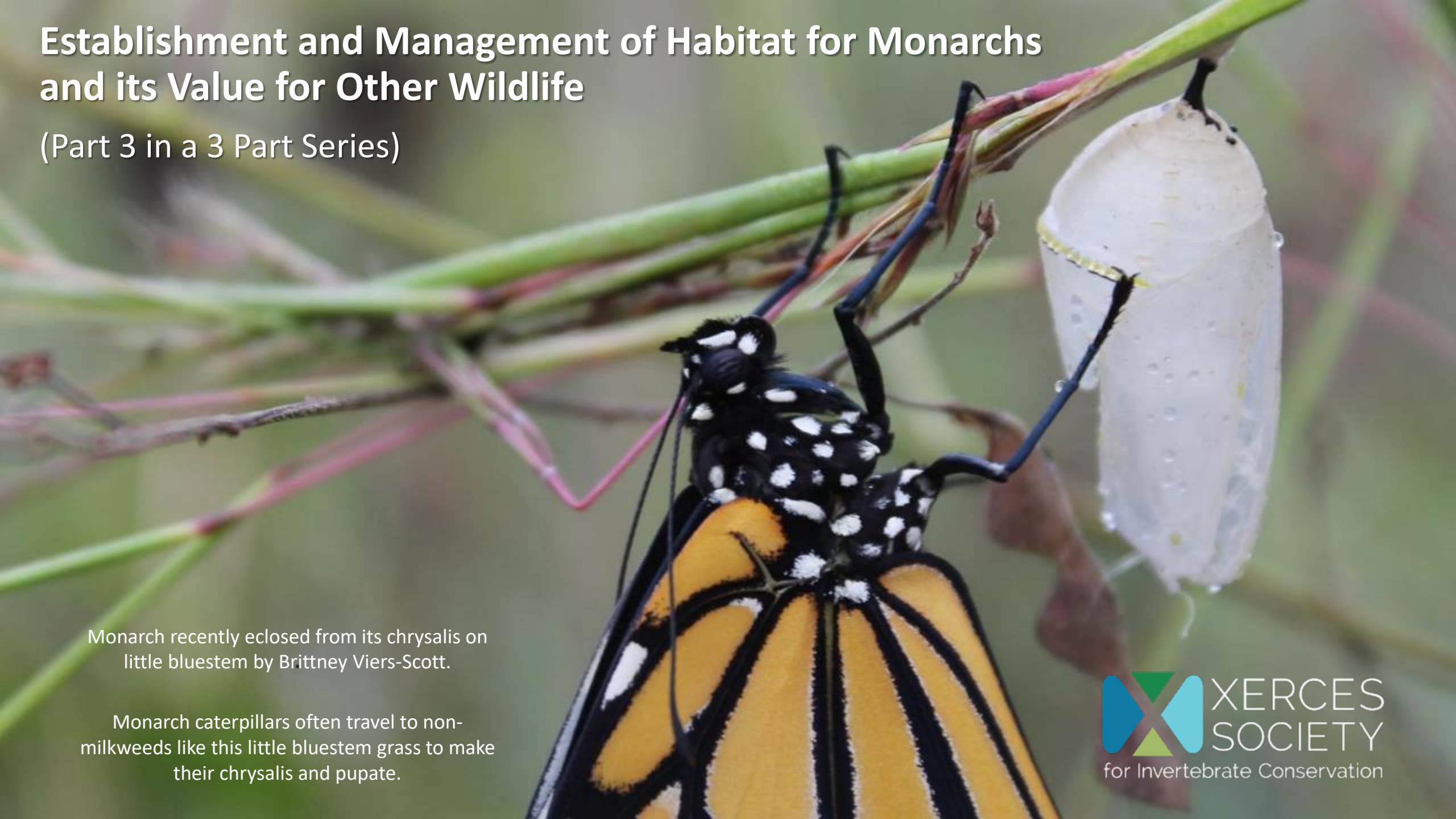
Establishment and Management of Habitat for Monarchs and its Value for Other Wildlife

(Part 3 in a 3 Part Series)



Monarch recently eclosed from its chrysalis on little bluestem by Brittney Viers-Scott.

Monarch caterpillars often travel to non-milkweeds like this little bluestem grass to make their chrysalis and pupate.

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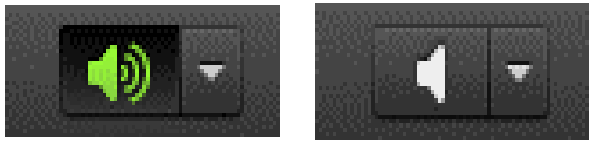
for Invertebrate Conservation

Logistics

Computer Speaker Status



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Network Connection Status

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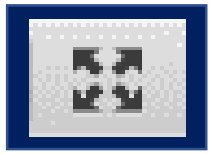
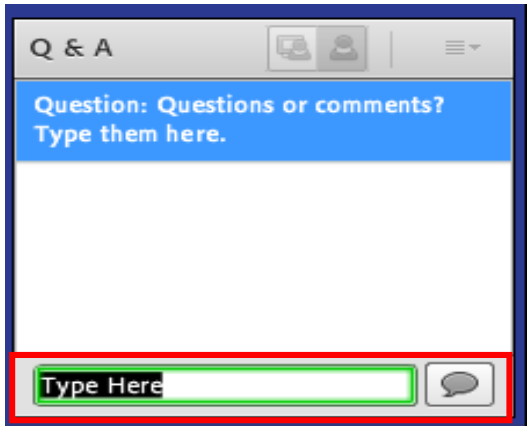
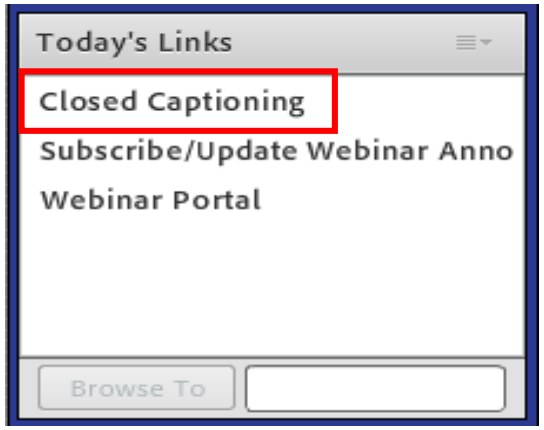


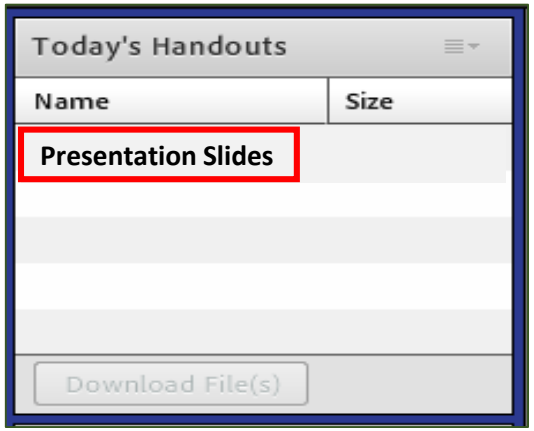
Q&A Pod



Today's Links



Today's Handouts



Establishment and Management of Habitat for Monarchs and its Value for Other Wildlife (Part 3 in a 3 Part Series)

Ray Moranz

Grazing Lands Pollinator Ecologist, Xerces Society and USDA NRCS CNTSC Stillwater, OK

Sudie Daves Thomas

Wildlife Biologist, SC NRCS, Manning, SC

Nancy Adamson

Senior Pollinator Conservation Specialist Xerces Society and USDA NRCS ENTSC Greensboro, NC

See http://conservationwebinars.net/ for replays

PART 1: **Introduction to Monarch Biology & Conservation in the Southeast**

PART 2 : **Essential Aspects of Monarch Habitat in the Southeast**

An update of Additional Resources that include answers to any questions we can't address today will be posted on the Conservation Webinars site with today's replay.

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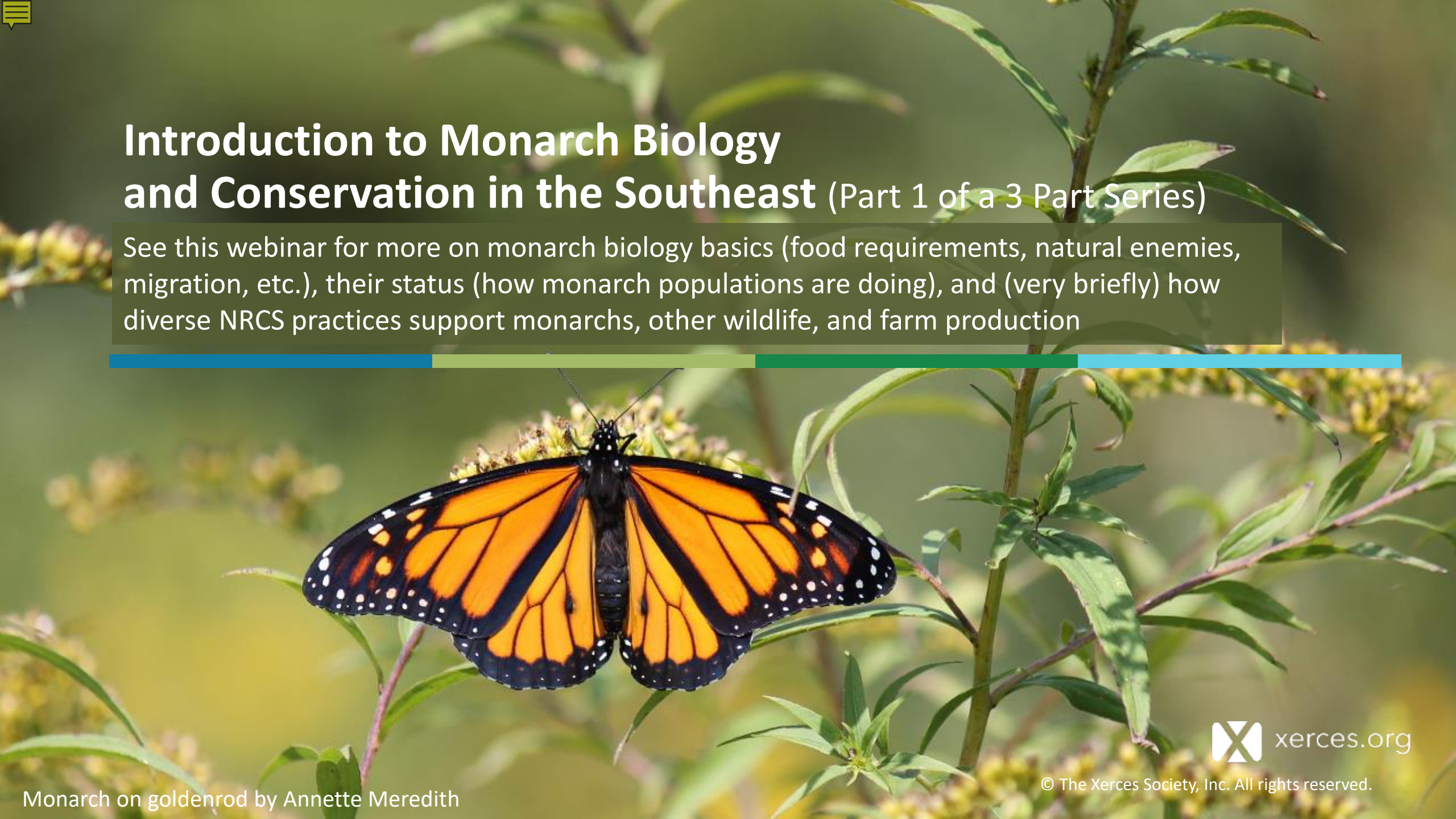
Introduction to Monarch Biology and Conservation in the Southeast (Part 1 of a 3 Part Series)

See this webinar for more on monarch biology basics (food requirements, natural enemies, migration, etc.), their status (how monarch populations are doing), and (very briefly) how diverse NRCS practices support monarchs, other wildlife, and farm production



Monarch on goldenrod by Annette Meredith

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Essential Aspects of Monarch Habitat in the Southeast

(Part 2 in a 3 Part Series)

See this webinar for more on southeastern milkweeds for larvae and nectar plants for adults, and field research conducted in coastal South Carolina by SCDNR biologist Billy McCord.

Monarch on tall thistle
by Ray Moranz

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Today's Outline

- NRCS Monarch WHEGs
- Implementing habitat & examples of habitat created using various NRCS practices
- Seed mixes & calculators

Additional Resources from all 3 webinars will be posted with the replay of this webinar and can also be found at https://tinyurl.com/SEMonarchs2020

Monarch recently eclosed from its chrysalis on little bluestem by Brittney Viers-Scott

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Habitat needs of monarchs and other arthropods that benefit agriculture

monarch on dotted mint,
Monarda punctata

Photo by Annette Meredith, NatureOnOurDoorstep.com

Whether you are working on a large farm or in an urban area, pollinators need:

- **Food & Water**
  - Nectar, pollen, host plants
- **Shelter**
  - Nest sites, overwintering sites
- **Safe haven from pesticides**

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Assessing habitat and designing improvements

Habitat planning process

1. Recognize existing habitat
2. Identify habitat deficiencies
3. Prioritize habitat improvements

Mr. Fuselier is using brush management, prescribed burning, and prescribed grazing to reduce invasive plants and enhance diversity for coastal prairie habitat restoration (EQIP).

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What is a WHEG??

- WHEG stands for **Wildlife Habitat Evaluation Guide**.
- NRCS creates these tools for various wildlife species (e.g. gopher tortoise) or for various land uses that are relevant as wildlife habitat (e.g. pasture)

Photos by Ray Moranz

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Why a WHEG?

The purposes of using the WHEG are to:

1. Evaluate benchmark monarch habitat conditions
2. Present management alternatives to improve conditions
3. Predict planned monarch habitat conditions that will result from implementing conservation practices
4. Monitor if habitat condition has improved as predicted (after conservation practices are implemented)

Photo by Mace Vaughan (Xerces Society)

Why a WHEG?
From practical standpoint...

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Swamp sunflower
(*Helianthus angustifolius*)

Why a WHEG?

There is a procedural need within NRCS

- NRCS considers monarchs to be wildlife (whereas honeybees are considered livestock)
- According to NRCS National Biologist, who oversees wildlife conservation for the agency….
- ……**NRCS policy requires** the use of an approved habitat evaluation tool….
- **anywhere in the nation** that wildlife is the focus of an NRCS-supported conservation effort

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Monarch Butterfly

Conference Report

A collaboration of the

Natural Resources Conservation Service

and the

U.S. Fish and Wildlife Service

December 2016

Using a WHEG protects producers

- NRCS consulted with USFWS in case monarch is listed
- If NRCS field staff and ag producers follow the guidance in the report, ag producers receive ESA predictability for 30 years
- This means that if monarch IS listed, if the actions of the ag producer result in“take” of monarch individuals or habitat, the producer will not be in violation of the ESA, as long as the producer was following the guidelines set out in the Conference Report
  - E.g. prescribed fire
- One of these guidelines includes using the monarch WHEG!

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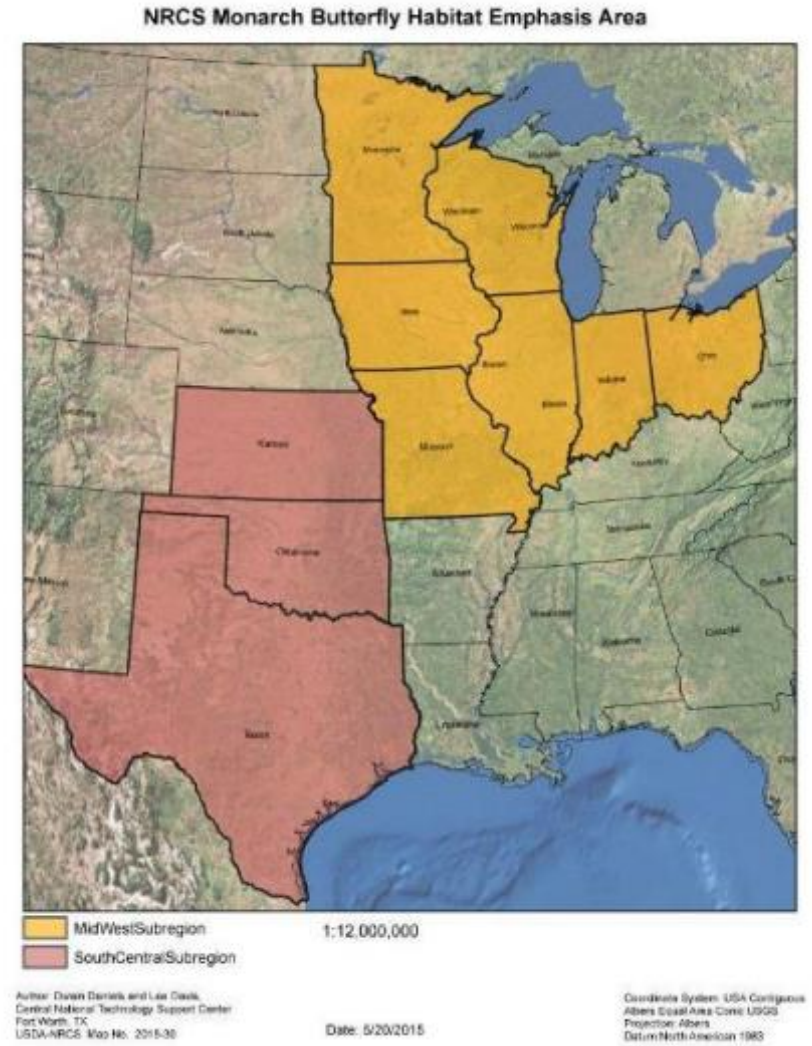
Conference Report was written for these states



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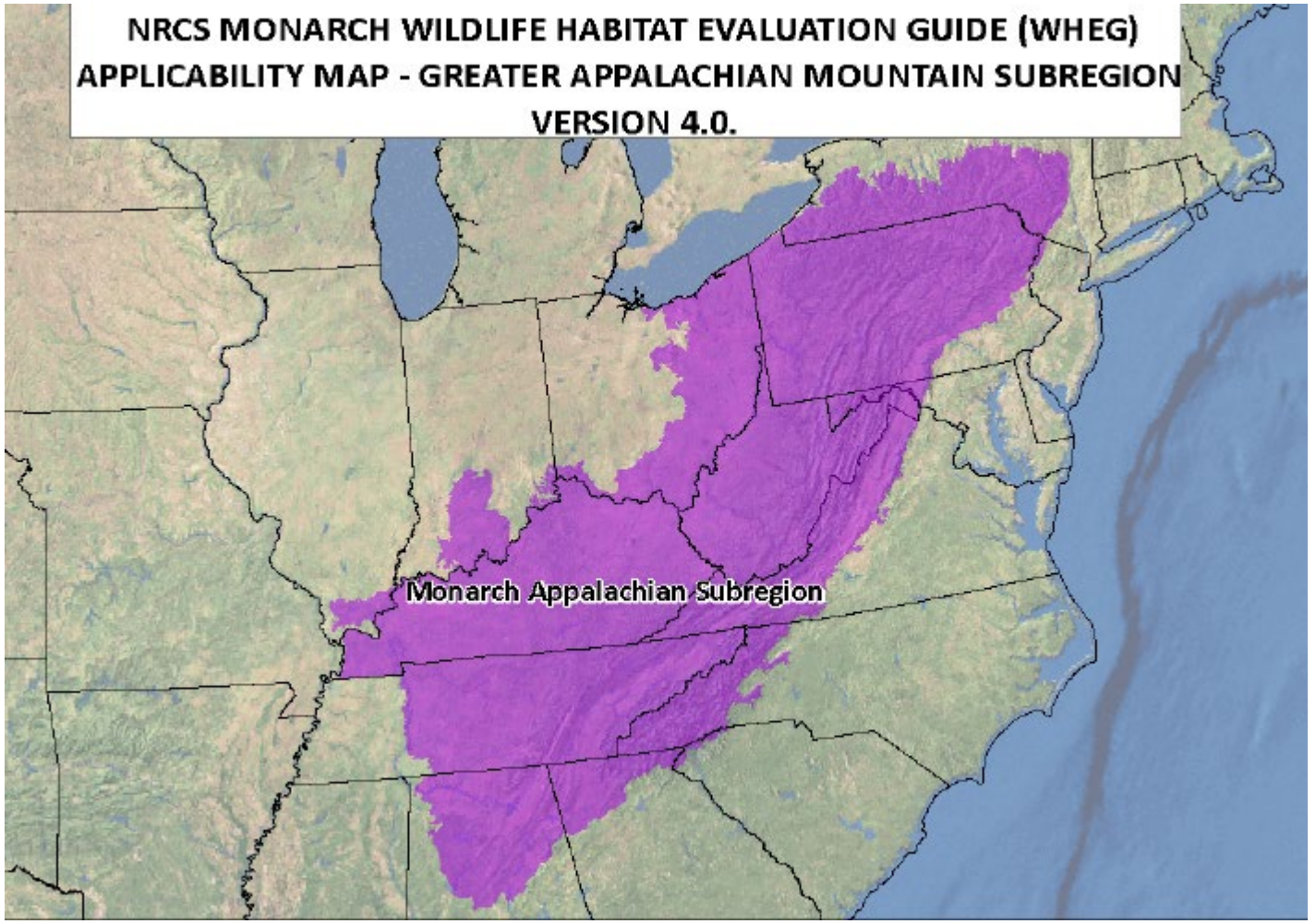
The Greater Appalachian Mountains WHEG

Reference Domain



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The West Gulf Coastal Plain WHEG

Reference Domain

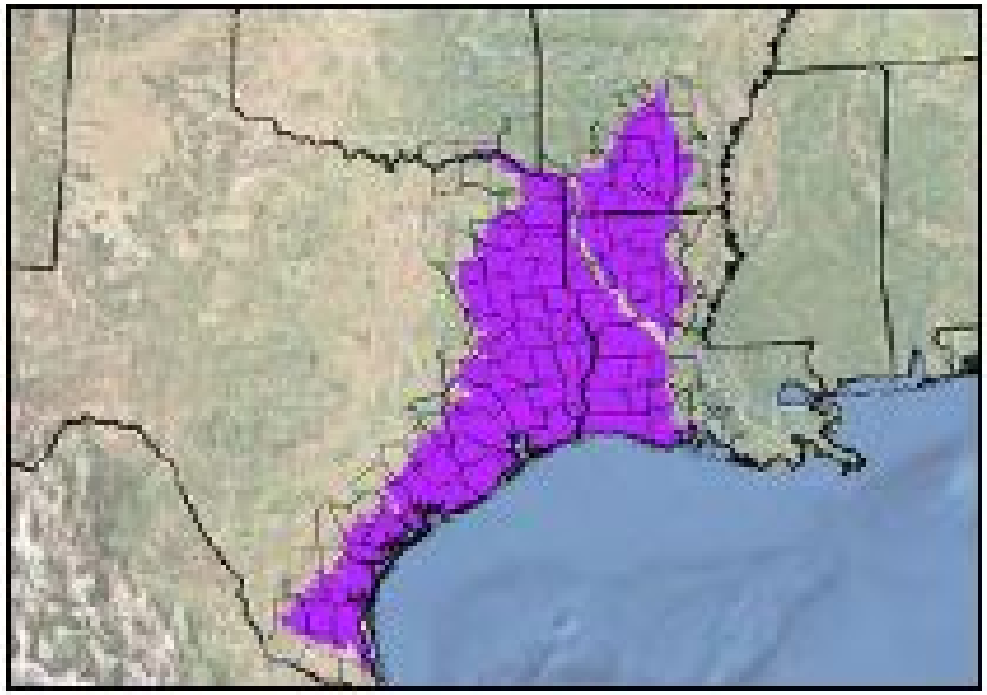

Fig. 1. Western Coastal Plain Monarch Region.

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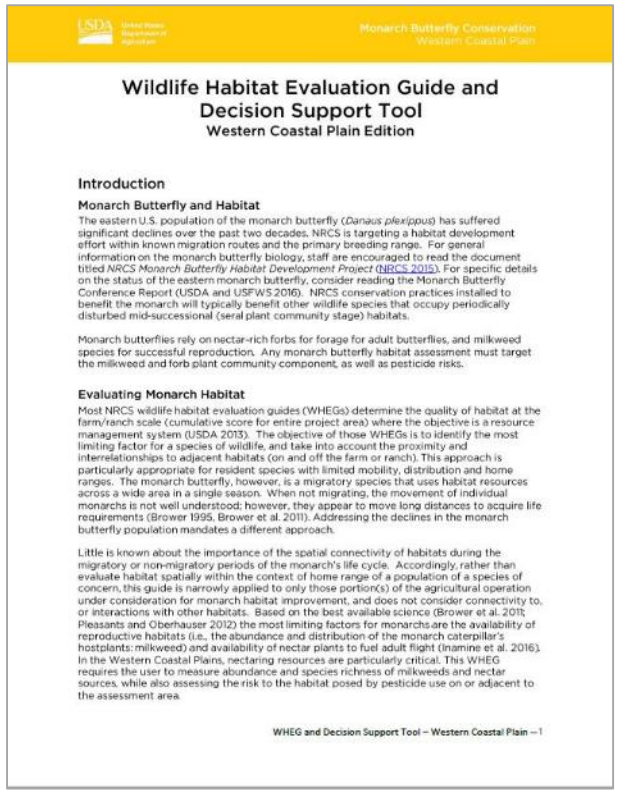
The West Gulf Coastal Plain WHEG

Written by James Baker (AR NRCS), Russell Castro (TX NRCS), Troy Malloch (LA NRCS) and NRCS CNTSC (Fort Worth)

1) Instructions



Monarch Butterfly Conservation
Western Coastal Plain

Wildlife Habitat Evaluation Guide and Decision Support Tool
Western Coastal Plain Edition

Introduction

Monarch Butterfly and Habitat

The eastern U.S. population of the monarch butterfly (*Danaus plexippus*) has suffered significant declines over the past two decades. NRCS is targeting a habitat development effort within known migration routes and the primary breeding range. For general information on the monarch butterfly biology, staff are encouraged to read the document titled *NRCS Monarch Butterfly Habitat Development Project* (NRCS 2015). For specific details on the status of the eastern monarch butterfly, consider reading the Monarch Butterfly Conference Report (USDA and USFWS 2016). NRCS conservation practices installed to benefit the monarch will typically benefit other wildlife species that occupy periodically disturbed mid-successional (seral plant community stage) habitats.

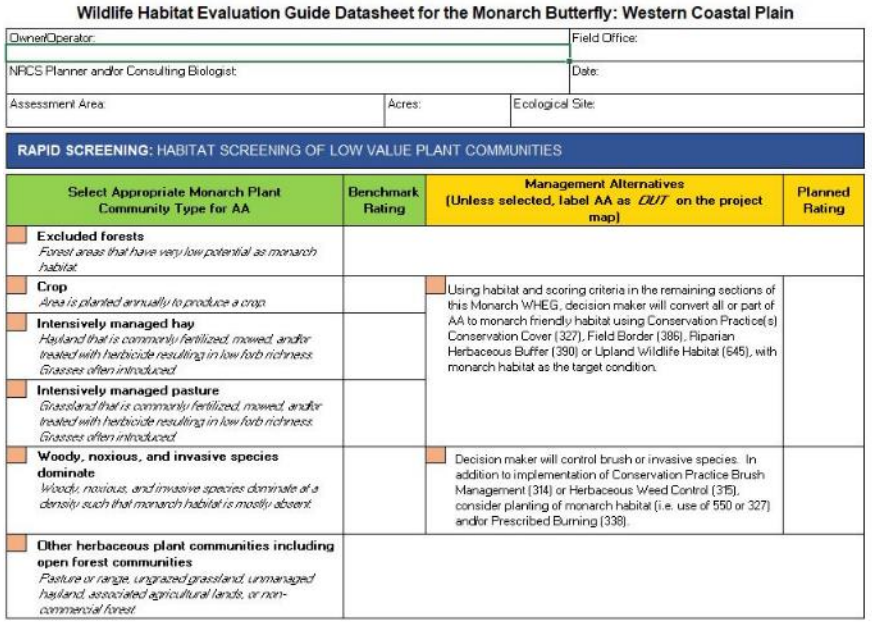
Monarch butterflies rely on nectar-rich forbs for forage for adult butterflies, and milkweed species for successful reproduction. Any monarch butterfly habitat assessment must target the milkweed and forb plant community component, as well as pesticide risks.

Evaluating Monarch Habitat

Most NRCS wildlife habitat evaluation guides (WHEGs) determine the quality of habitat at the farm/ranch scale (cumulative score for entire project area) where the objective is a resource management system (USDA 2013). The objective of those WHEGs is to identify the most limiting factor for a species of wildlife, and take into account the proximity and interrelationships to adjacent habitats (on and off the farm or ranch). This approach is particularly appropriate for resident species with limited mobility, distribution and home ranges. The monarch butterfly, however, is a migratory species that uses habitat resources across a wide area in a single season. When not migrating, the movement of individual monarchs is not well understood; however, they appear to move long distances to acquire life requirements (Brower 1995, Brower et al. 2011). Addressing the declines in the monarch butterfly population mandates a different approach.

Little is known about the importance of the spatial connectivity of habitats during the migratory or non-migratory periods of the monarch's life cycle. Accordingly, rather than evaluate habitat spatially within the context of home range of a population of a species of concern, this guide is narrowly applied to only those portion(s) of the agricultural operation under consideration for monarch habitat improvement, and does not consider connectivity to, or interactions with other habitats. Based on the best available science (Brower et al. 2011; Pleasants and Oberhauser 2012) the most limiting factors for monarchs are the availability of reproductive habitats (i.e., the abundance and distribution of the monarch caterpillar's hostplants: milkweed) and availability of nectar plants to fuel adult flight (Inamine et al. 2016). In the Western Coastal Plains, nectaring resources are particularly critical. This WHEG requires the user to measure abundance and species richness of milkweeds and nectar sources, while also assessing the risk to the habitat posed by pesticide use on or adjacent to the assessment area.

2) Datasheet



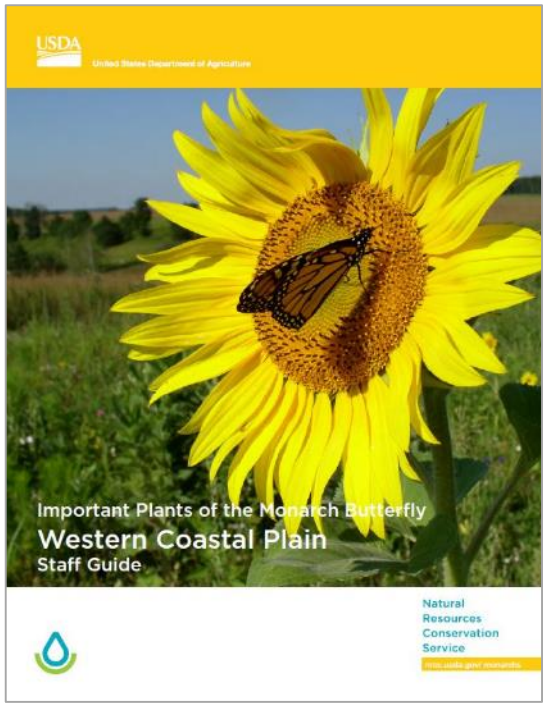
Wildlife Habitat Evaluation Guide Datasheet for the Monarch Butterfly: Western Coastal Plain

Owner/Operator:		Field Office:
NRCS Planner and/or Consulting Biologist:		Date:
Assessment Area:	Acres:	Ecological Site:

RAPID SCREENING: HABITAT SCREENING OF LOW VALUE PLANT COMMUNITIES

Select Appropriate Monarch Plant Community Type for AA	Benchmark Rating	Management Alternatives (Unless selected, label AA as *OUT* on the project map)	Planned Rating
☐ **Excluded forests** *Forest areas that have very low potential as monarch habitat*			
☐ **Crop** *Area is planted annually to produce a crop*		☐ Using habitat and scoring criteria in the remaining sections of this Monarch WHEG, decision maker will convert all or part of AA to monarch friendly habitat using Conservation Practice(s) Conservation Cover (327), Field Border (386), Riparian Herbaceous Buffer (390) or Upland Wildlife Habitat (645), with monarch habitat as the target condition.	
☐ **Intensively managed hay** *Hayland that is commonly fertilized, mowed, and/or treated with herbicide resulting in low forb richness. Grasses often introduced*			
☐ **Intensively managed pasture** *Grassland that is commonly fertilized, mowed, and/or treated with herbicide resulting in low forb richness. Grasses often introduced*			
☐ **Woody, noxious, and invasive species dominate** *Woody, noxious, and invasive species dominate at a density such that monarch habitat is mostly absent*		☐ Decision maker will control brush or invasive species. In addition to implementation of Conservation Practice Brush Management (314) or Herbaceous Weed Control (315), consider planting of monarch habitat (i.e. use of 550 or 327) and/or Prescribed Burning (338).	
☐ **Other herbaceous plant communities including open forest communities** *Pasture or range, ungrazed grassland, unmanaged hayland, associated agricultural lands, or non-commercial forest*			

3) Plant Guide



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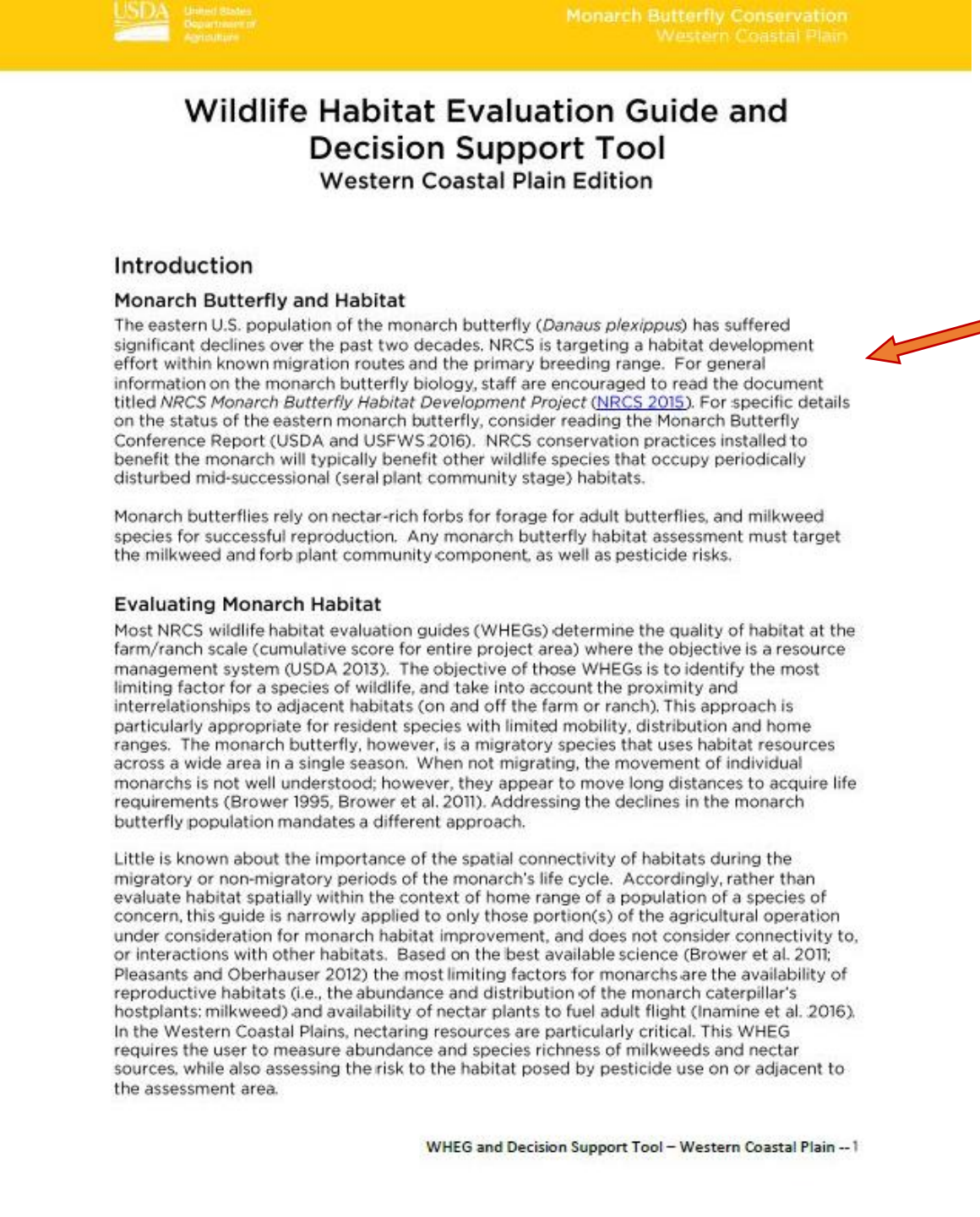

Doc. 1) WHEG instructions

- Provides detailed instructions on each step of the evaluation process.
- 10 pages
- (Instructions for the Greater Appalachian WHEG are 35 pages)

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Doc. 2) the WHEG Data Sheet

Wildlife Habitat Evaluation Guide Datasheet for the Monarch Butterfly: Western Coastal Plain

Owner/Operator:		Field Office:
NRCS Planner and/or Consulting Biologist:		Date:
Assessment Area:	Acres:	Ecological Site:

RAPID SCREENING: HABITAT SCREENING OF LOW VALUE PLANT COMMUNITIES

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☐ **Other herbaceous plant communities including open forest communities** *Pasture or range, ungrazed grassland, unmanaged hayland, associated agricultural lands, or non-commercial forest.*			

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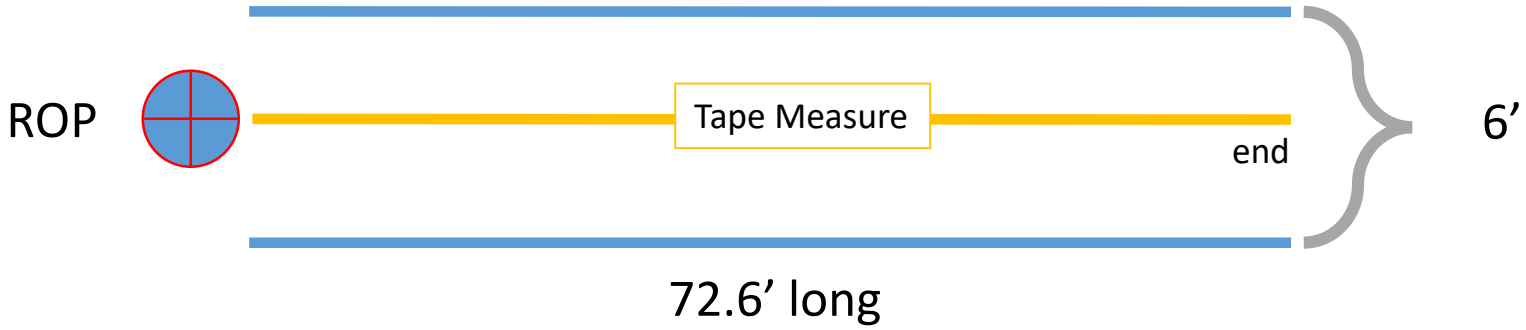
Sample vegetation to determine milkweed density and nectaring forb cover and richness

- Locate at least 3 Representative Observation Points within the AA that are representative of the vegetation.
- Collect the following data:
  - Milkweed stem count
  - Nectaring forb cover
  - Nectaring forb species richness



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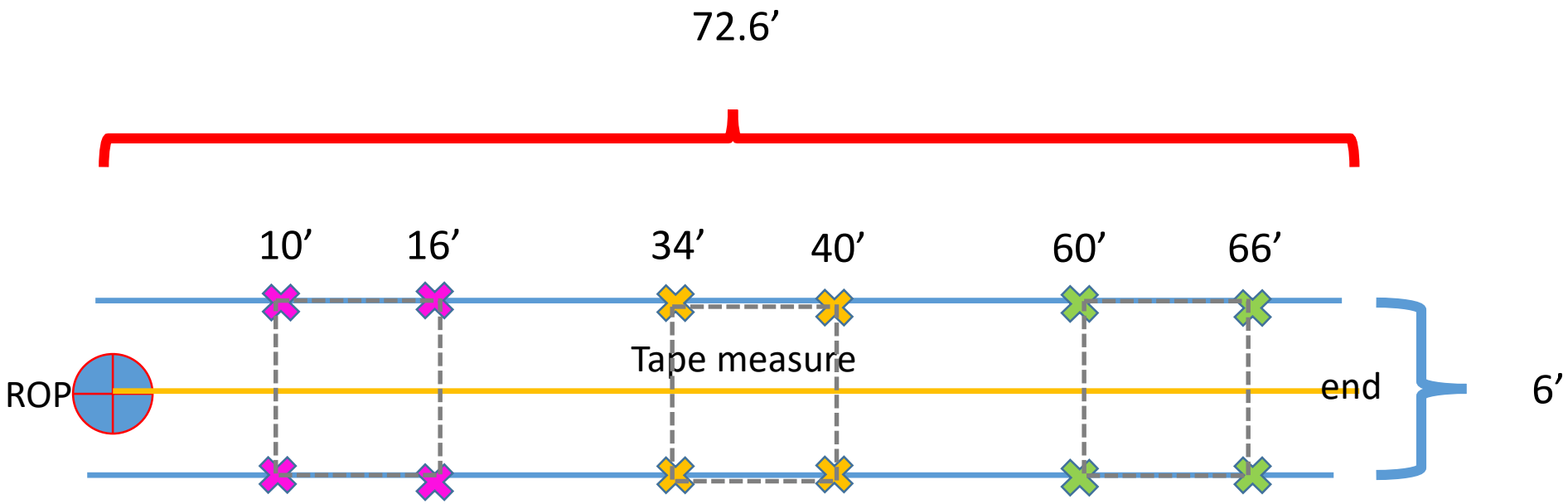
Count Milkweed Stem Density

Walk the full distance of the transect (72.6’ x 6’) noting the presence of *Asclepias* plants emerging from within the belt transect

Photo by Kelly Gill (Xerces Society)

Vegetation Plot Data

- You'll create three 6' x 6' square plots to collect nectaring forb cover and nectaring forb species richness data. (You can use four pin flags or other tools to help mark).



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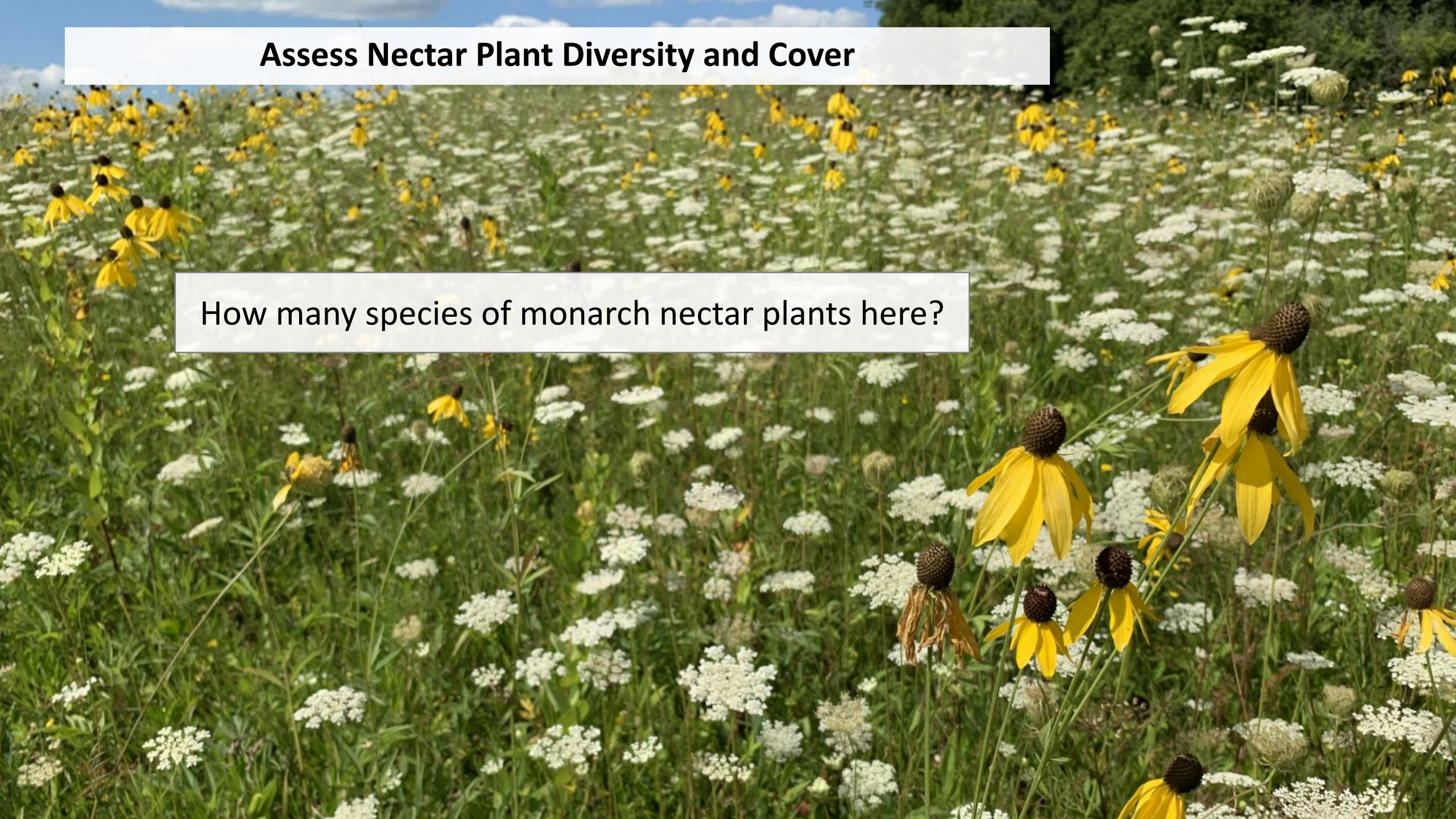
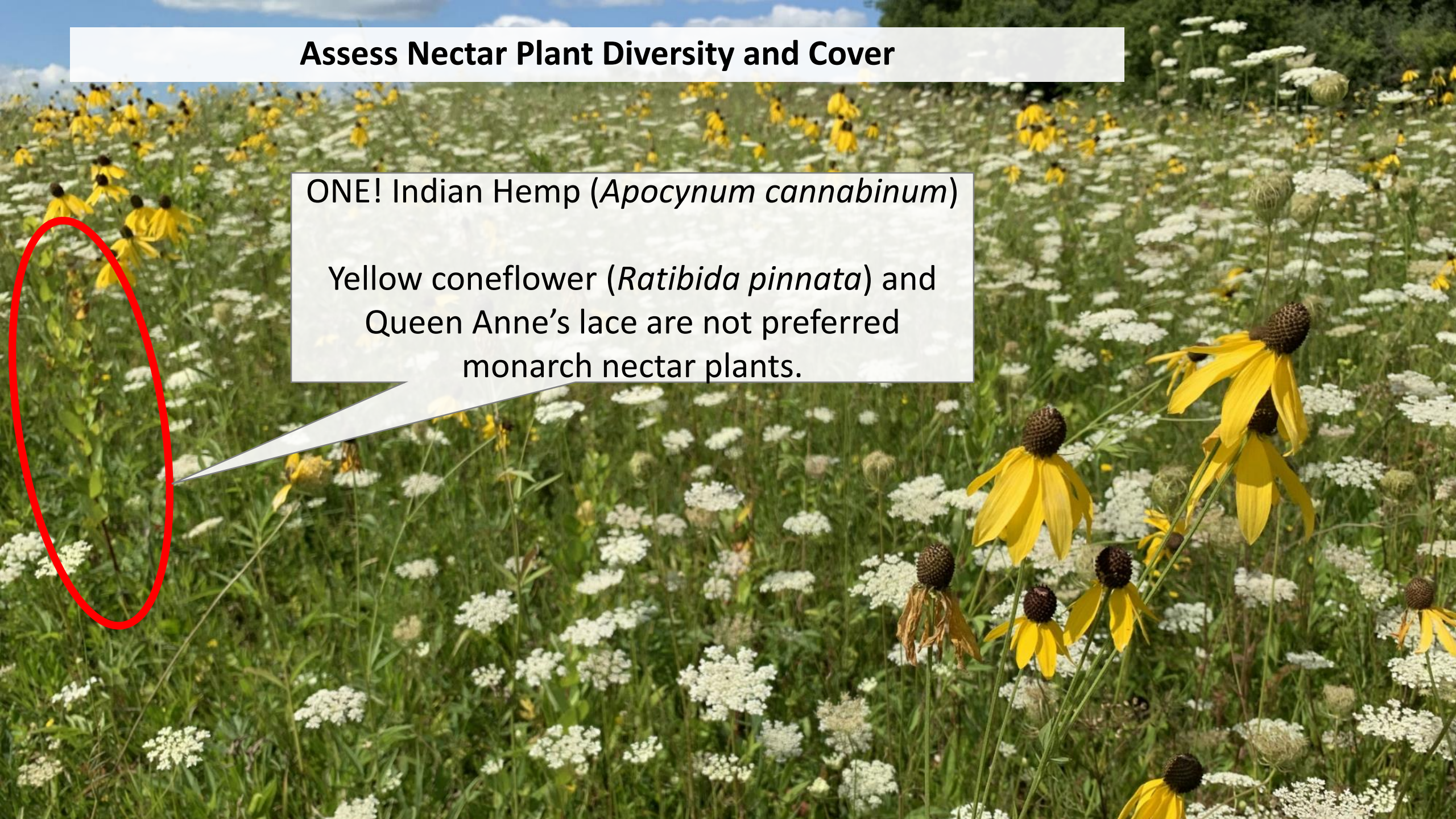
Assess Nectar Plant Diversity and Cover

How many species of monarch nectar plants here?

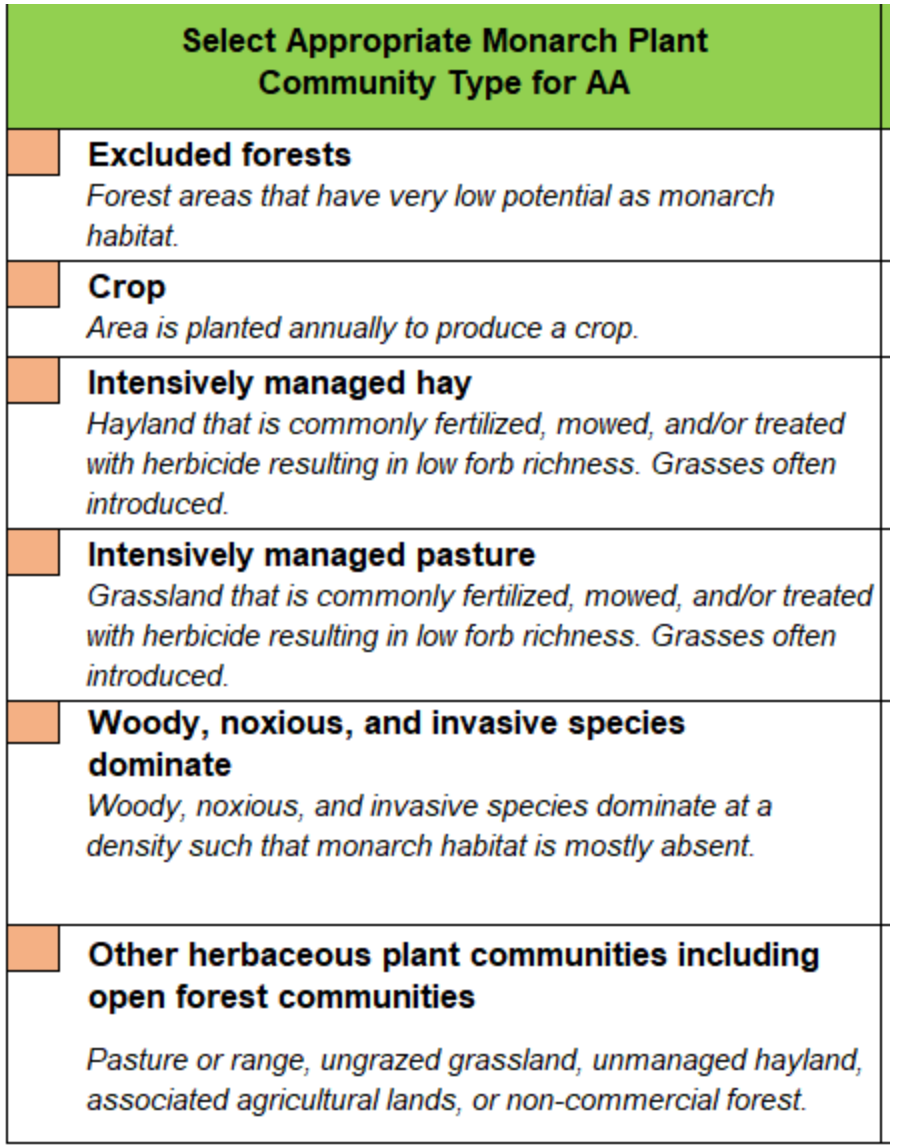


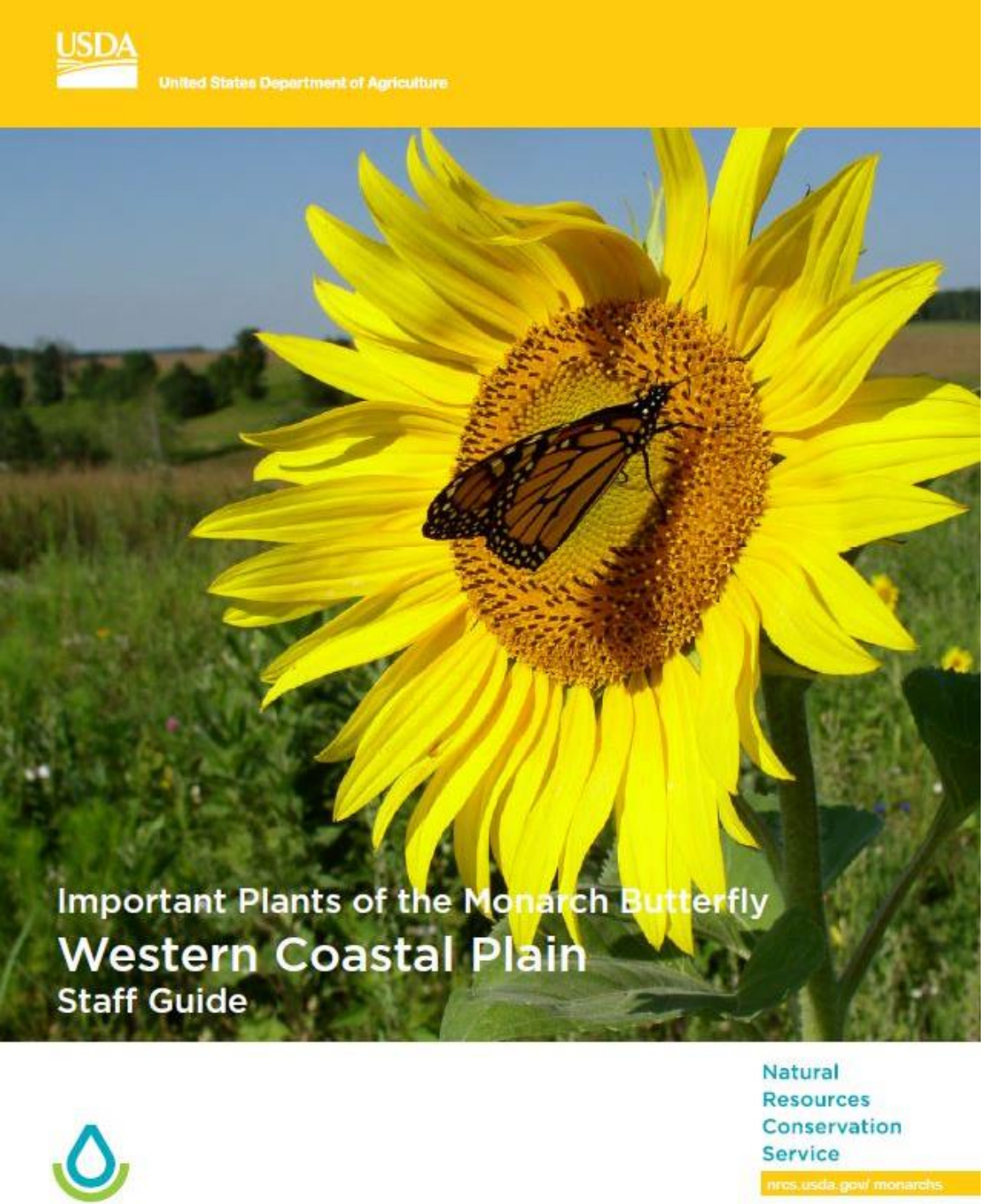
Assess Nectar Plant Diversity and Cover



Do Rapid Screening of Assessment Areas (AAs)

- **Where? Page 1 of WHEG Datasheet.**
- **Why?**
- **To save time!**
- Don’t waste time evaluating monarch habitat in a corn field!
- If AA one of the plant communities that is not good monarch habitat now…
- …and if landowner is willing to convert to wonderful habitat, great! **No need to collect data**. Just plan management.
- If landowner is NOT willing, then fuhgeddaboudit !! (Label it as OUT on base map).





Doc. 3) Monarch Plant Identification Guide

- 104 pages
- A useful document to have, even if you never evaluate monarch habitat using a WHEG

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Aquatic Milkweed

Milkweed Family

Other Common Names: white milkweed, smoothseed milkweed

Scientific Name: *Asclepias perennis* Walter

Plant Symbol: ASPE

Duration: Perennial, herbaceous

Plant Height: 1-2 feet.

Blooms/Fruits: May-September

Distinguishing characteristics: Stems usually solitary and branched with multiple pairs of opposite leaves; leaves are narrow, approximately 4 inches long by 1 inch wide, lance shaped, tapered at both ends, and with a short leaf stalk; inflorescences 2-6 on stalks from the axils of the upper leaves; flowers white and commonly fringed with pink while in bud.

Pollinator Value: Little is known about the pollination biology of this species. Flowers are visited by butterflies and native bees.

Habitat: Wetland habitats, shrub-tree bays and bogs, swamps sloughs, pond and lake margins, roadside ditches, and bottomland forests.

Note: The seeds of this wetland plant does not have the characteristic tuft of hairs of most milkweeds. Instead, the seeds are winged as an adaption for water dispersal as opposed to wind dispersal.

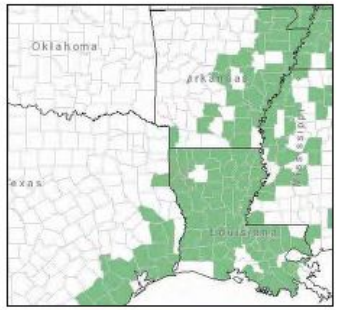

Photo by Harry Cliffe, Lady Bird Johnson Wildflower Center.

USDA United States Department of Agriculture
Important Plants of the Monarch Butterfly
Western Coastal Plain

Full flowering/close-up of bloom

Photos courtesy of Sally and Andy Wasowski and Joseph Marcus; Lady Bird Johnson Wildflower Center.

Leaf arrangement/ leaf shape

Photos courtesy of Pete Loos, Joseph Marcus and Alan Cressler, Lady Bird Johnson Wildflower Center.

INVENTORY Plant List

The list of plants that you search for when visiting a site

					Bloom Period		
Species name	Plant symbol	Common name	Growth habit	Monarch value	Early	Mid	Late
Asclepias spp.	ASCLE	milkweed	forb/herb	very high		x	x
Baccharis halimifolia	BAHA	eastern baccharis	shrub	high		x	x
Bidens aristosa	BIAR	bearded beggarticks	forb/herb	very high	x	x	x
Cephalanthus occidentalis	CEOC2	common buttonbush	shrub	high		x	x
Cirsium discolor	CIDI	field thistle	forb/herb	high		x	x
Conoclinium coelestinum	COCO13	blue mistflower	forb/herb	high		x	x
Echinacea pallida	ECPA	purple prairie coneflower	forb/herb	high		x	
Eupatorium serotinum	EUSE2	lateflowering thoroughwort	forb/herb	high		x	x
Eutrochium fistulosum	EUFI14	Joe pye weed	forb/herb	high		x	x
Gaillardia pulchella	GAPU	Indian blanket	forb/herb	high	x	x	
Glandularia bipinnatifida	GLBI2	Dakota mock vervain	forb/herb	high	x	x	x
Helenium amarum	HEAM	sneezeweed	forb/herb	high	x	x	x
Helianthus spp.	HELIA3	sunflower	forb/herb	high		x	x
Heliopsis helianthoides	HEHE5	smooth oxeye	forb/herb	high		x	x
Liatris spp.	LIATR	blazing star	forb/herb	very high		x	x
Monarda spp.	MONAR	beebalm	forb/herb	high		x	x
Packera obovata	PAOB6	roundleaf ragwort	forb/herb	high	x		
Phlox divaricata	PHDI5	wild blue phlox	forb/herb	high	x		
Pluchea odorata	PLOD	sweetscent	forb/herb	high	x	x	x
Polygonum pensylvanicum	POPE2	Pennsylvania smartweed	forb/herb	high	x	x	x
Salvia spp.	SALVI	sage	forb/herb	high	x	x	x
Silphium spp.	SLIPH	rosinweed, compass plant	forb/herb	high	x	x	x
Smallanthus uvedalius	SMUV	hairy leafcup	forb/herb	high		x	
Solidago spp.	SOLID	goldenrod	forb/herb	high		x	x
Symphyotrichum spp.	SYPMP4	aster	forb/herb	high		x	x
Verbena halei	VEHA	Texas Vervain	forb/herb	high	x	x	x
Verbesina virginica	VEVI3	white crownbeard	forb/herb	high		x	x
Vernonia spp.	VERNO	ironweed	forb/herb	high		x	x

USDA, NRCS. 2017. PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Glandularia bipinnatifida	GLBI2	Dakota mock vervain
Helenium amarum	HEAM	sneezeweed
Helianthus spp.	HELIA3	sunflower
Heliopsis helianthoides	HEHE5	smooth oxeye
Liatris spp.	LIATR	blazing star
Monarda spp.	MONAR	beebalm
Packera obovata	PAOB6	roundleaf ragwort

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Monarch Planting List

					Bloom Period			States		
Species name	Plant symbol	Common name	Growth habit	Monarch value	Early	Mid	Late	AR	LA	TX
Asclepias incarnata	ASIN	swamp milkweed	forb/ herb	very high		x	x			
Asclepias lanceolata	ASLA2	fewflowered milkweed	forb/ herb	very high	x	x				
Asclepias perennis	ASPE	aquatic milkweed	forb/ herb	very high	x	x				
Asclepias tuberosa	ASTU	butterfly milkweed	forb/ herb	high		x	x			
Asclepias viridis	ASVI2	spider milkweed	forb/ herb	very high	x	x				
Bidens aristosa	BIAR	bearded beggarticks	forb/ herb	very high	x	x	x			
Cirsium discolor	CIDI	field thistle	forb/ herb	high		x	x			
Conoclinium coelestinum	COCO13	blue mistflower	forb/ herb	high		x	x			
Echinacea pallida	ECPA	purple prairie coneflower	forb/ herb	high		x				
Eupatorium serotinum	EUSE2	lateflowering thoroughwort	forb/ herb	high		x	x			
Eutrochium fistulosum	EUFI14	Joe pye weed	forb/ herb	high		x	x			
Gaillardia pulchella	GAPU	Indian blanket	forb/ herb	high	x	x				
Glandularia bipinnatifida	GLBI2	Dakota mock vervain	forb/ herb	high	x	x	x			
Helenium amarum	HEAM	sneezeweed	forb/ herb	high	x	x	x			
Helianthus angustifolius	HEAN2	swamp sunflower	forb/ herb	high		x	x			
Helianthus annuus	HEAN3	common sunflower	forb/ herb	very high		x	x			
Heliopsis helianthoides	HEHE5	smooth oxeye	forb/ herb	high		x				
Liatris aspera	LIAS	tall blazing star	forb/ herb	very high		x	x			
Liatris elegans	LIEL	pinkscale blazing star	forb/ herb	high		x	x			
Liatris pycnostachya	LIPY	prairie blazing star	forb/ herb	high		x	x			
Monarda fistulosa	MOFI	wild bergamont	forb/ herb	high		x				
Monarda punctata	MOPU	spotted beebalm	Forb /herb	high		x				

					Bloom Period			States		
Species name	Plant symbol	Common name	Growth habit	Monarch value	Early	Mid	Late	AR	LA	TX
Packera obovata	PAOB6	roundleaf ragwort	forb/ herb	high	x	x				
Phlox divaricata	PHDI5	wild blue phlox	forb/ herb	high	x	x				
Pluchea odorata	PLOD	sweetscent	forb/ herb	high		x	x			
Polygonum pensylvanicum	POPE2	Pennsylvania smartweed	forb/ herb	high		x	x			
Salvia azurea	SAAZ	azura blue sage	forb/ herb	high		x	x			
Salvia coccinea	SACO5	blood sage	forb/ herb	high	x	x	x			
Silphium integrifolium	SLIN2	wholeleaf rosinweed	forb/ herb	high	x	x	x			
Silphium laciniatum	SILA3	compass plant	forb/ herb	high		x				
Smallanthus uvedalius	SMUV	hairy leafcup	forb/ herb	high		x				
Solidago altimissa	SOAL6	tall goldenrod	forb/ herb	high		x	x			
Solidago petiolaris	SOPE	downy ragged goldenrod	forb/ herb	high		x	x			
Solidago sempervirens	SOSE	seaside goldenrod	forb/ herb	high		x	x			
Solidago speciosa	SOSP2	showy goldenrod	forb/ herb	very high		x	x			
Symphyotrichum drummondii	SYDR	Drummond's aster	forb/ herb	high		x	x			
Symphyotrichum patens	SYPA11	late purple aster	forb/ herb	high		x	x			
Symphyotrichum praealtum	SYPR5	willowleaf aster	forb/ herb	high		x	x			
Verbena halei	VEHA	Texas vervain	forb/ herb	high	x	x				
Verbesina virginica	VEVI3	white crownbeard	forb/ herb	high		x	x			
Vernonia gigantea	VEGI	giant ironweed	forb/ herb	high		x	x			
Vernonia texana	VETE3	Texas ironweed	forb/ herb	high		x				

USDA, NRCS. 2017. PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Monarch PLANTING List

Liatris elegans	LIEL	pinkscale blazing star	forb/ herb
Liatris pycnostachya	LIPY	prairie blazing star	forb/ herb
Monarda fistulosa	MOFI	wild bergamont	forb/ herb
Monarda	MOPU	spotted	Forb

Xerces Society Monarch Nectar Plant Database

652	Gaillardia aristata	Blanketflower		Gardens and shortgrass prairie	CO	July-Sept
316	Gaillardia pulchella	Indian blanket		Mid-Atlantic coast (dune areas)	NC, VA, NJ,	Aug - Sept
533	Gaillardia pulchella var. pulche	Beach blanket-flower		Folly Beach, SC	SC	Fall migration
1619	Gaillardia sp.	Blanketflower	#	east end Carol St., Ashland OR	OR	10/23/2017
1204	Gaillardia sp.	Blanketflower		Chincoteague NWR on Assateag	VA	Summer breeding perioc
812	Geranium richardsonii	Richardson's geranium		Mid to high elevations, AZ	AZ	Late summer through fa
187	Glandularia bipinnatifida	Dakota mock vervain		Collin Co, TX	TX	4/19/2014
1428	Glandularia bipinnatifida	Dakota mock vervain		North central Texas	TX	Unknown
1061	Glandularia bipinnatifida	Dakota mock vervain			TX	Spring
1077	Glandularia gooddingii	Southwestern mock verv		Lower and middle elevations of	AZ	Spring through summer
511	Grindelia papposa	Spanish gold		Stillwater, OK	OK	Fall 212, 2013, 2014
1363	Grindelia sp.	Gumweed		California	CA	Unknown
1190	Grindelia squarrosa	Curlycup gumweed		Nevada	NV	Summer
417	Gutierrezia sarothrae	Broom snakeweed	#		OK	August, September, Octc

Sadly, we have few data from the southeast!!

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Please report your observations regarding nectar plant use!!

652	Gaillardia aristata	Blanketflower		Gardens and shortgrass prairie	CO	July-Sept
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If you have seen monarchs nectaring on native plants in the Southeast, please email

ray.moranz@xerces.org

xerces.org

NRCS Monarchs webpage (http://nrcs.usda.gov/monarchs)

- **search "NRCS Monarchs"**, go to bottom of page

Greater Appalachian Mountains Region Resources

Instructions for Monarch Butterfly Wildlife Habitat Evaluation Guide and Decision Support Tool: Greater Appalachian Mountains (PDF, 2MB)
Monarch Butterfly Wildlife Habitat Evaluation Guide (WHEG) Data Sheet: Greater Appalachian Mountains Region (XLSX, 1MB)
Important Plants and Plant Lists of the Monarch Butterfly – Greater Appalachian Mountains Region (PDF, 12MB)
Best Practices for the Monarch Butterfly – Greater Appalachian Mountains Region (PDF, 73KB)

Western Coastal Plain Resources

- Instructions for Monarch Butterfly Wildlife Habitat Evaluation Guide and Decision Support Tool: Western Coastal Plain, (PDF, 530KB)
- Monarch Butterfly Wildlife Habitat Evaluation Guide (WHEG) Data Sheet: Western Coastal Plain (XLSX, 256KB)
- Important Plants and Plant Lists of the Monarch Butterfly - Western Coastal Plain (PDF, 13.3MB)
- Best Practices for the Monarch Butterfly - Western Coastal Plain Region (PDF, 72kb)

Is planting appropriate?* Consider “daylighting” healthy native seed banks

Donahue pine flatwood in South Carolina

What is the history of the site?

Was it previously cultivated?

If not, the **existing seed bank** may be the most appropriate seed source.

Photo: Sudie Daves Thomas, SC NRCS

*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

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“Daylight” the seed bank by opening the canopy

Bringing in sunlight by thinning and/or burning may be the best restoration strategy.

Associated NRCS practices:

- **314b** Brush Management
- **315b** Herbaceous Weed Trmt
- **338** Prescribed Burning*
- **409** Prescribed Forestry
- **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

*Not available in every state

Carolina Bay in NC restored with thinning & burning

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If planting is appropriate, follow these Monarch Habitat Planting requirements

- Minimum 10 native herb species
- Local ecotype preferred
- 9 or more forbs
- 60% of mix must be forbs* preferred by monarchs (indicated in plant list and seed calculator)
- 3 or more species blooming per season (Spring, Summer, Fall)
- Minimum 1.8% of mix consists of *Asclepias* (milkweed)
- + 1 or more native grass species for structure and fire fuel
- 40-60 seeds per sq. ft. (use high end of range if seed broadcast)
- No species can be more than 20% of mix
- Plot size 1/2 – 2 ac

Seek out seed vendors that produce locally native species, NRCS Biologists, Native Plant Societies, or other conservation partners with this information for your area

Native grasses are beneficial as structure for pupation. Grasses can also hold up tall wildflowers that tend to fall over

Seed Calculator can assist to create appropriate seed mix complying with requirements

Seed specifications can be created with the calculator and presented to vendors as a starting point

(Seed Mix Calculators will be covered in more detail later)

Implementing Habitat

(with a focus on seeding)

For landowners wanting to avoid herbicides for site preparation and management, consider diverse native hedgerows.

Diverse native hedgerows mixing trees, shrubs, herbaceous perennials, and grasses provide pollen, nectar, and nesting habitat.

Weed management may be easier.

https://tinyurl.com/DiverseNativeHedgerow

Photo Credit: Nancy Lee Adamson

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Site Prep Methods*-- Reduce weed competition

How do you decide on the best approach? Consider:

- Landowner priorities, such as conventional or organic methods
- Current and historic land use (***key****: how bad are invasive weeds?)*
- Available equipment, contract timing, species to be planted

#1 reason for native stand failures is inadequate weed control

*For most states, outlined in Wildlife Habitat Planting (420) Implementation Requirements c/o Field Office Technical Guide (FOTG) https://efotg.sc.egov.usda.gov/

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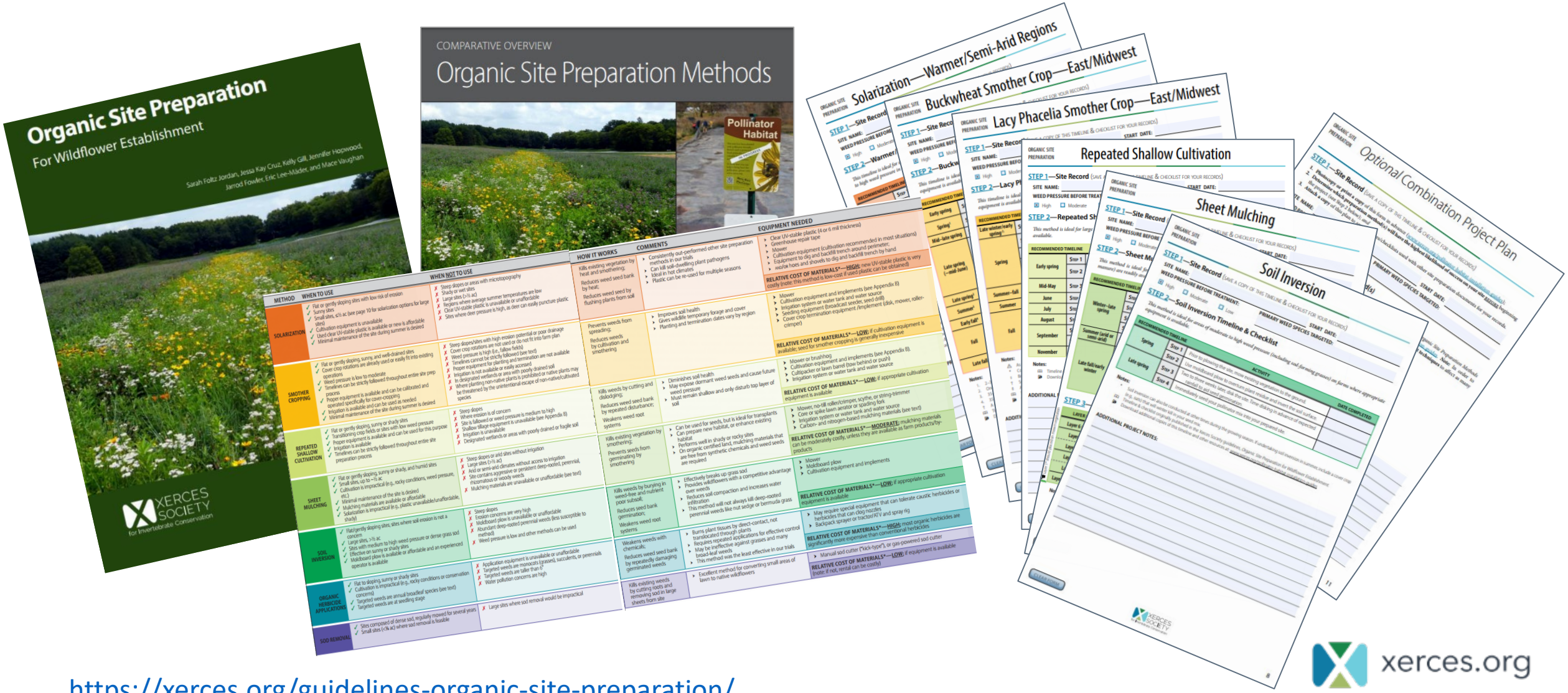
Organic Site Prep Methods: Guide, Overview, Timelines & Checklists



https://xerces.org/guidelines-organic-site-preparation/

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Seeding—Divide for good coverage; Firm seedbed

Divide seed into at least 2 (3-4) batches to ensure cover site (start each batch from different corner)
For drill, sort similar seed (size/fluff) into various hoppers
Consider planting wetter/drier areas separately (different seed set)

Photos: Nancy Lee Adamson

Be sure ground is firm before planting!!!

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Expectations & first two seasons' management

Prevent weeds from going to seed, reduce shade to new seedlings, avoid smothering seedlings.

First season

- When planting is 12-15" tall, mow to 6-8" tall. Repeat as needed.
- If mow when taller, remove thatch to avoid smothering seedlings.
- **NOTE: Mowing the first season is hard for growers. Schedule field site visits to ensure timely mowing.**

Second season

- Mow as needed to prevent weeds from going to seed without smothering new plants.

Hop'n Blueberry Farm, Black Mountain, NC

←Narrow-leaved sunflower seedling with winter weed (*Veronica* sp.)

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Expectations 3rd season & beyond

Long term: Monitor for weeds and cut out or spot treat. Avoid disturbing more than 1/3* at one time.

Hop'n Blueberry Farm, Black Mountain, NC

April & May photos by Van Burnette, July by Nancy Lee Adamson.

*NRCS Conservation Practice 338 (prescribed burning) is not currently offered in WV. If offered in the future, note that you may need to disturb the whole area at once. That's ok—long term benefits outweigh short term impacts.

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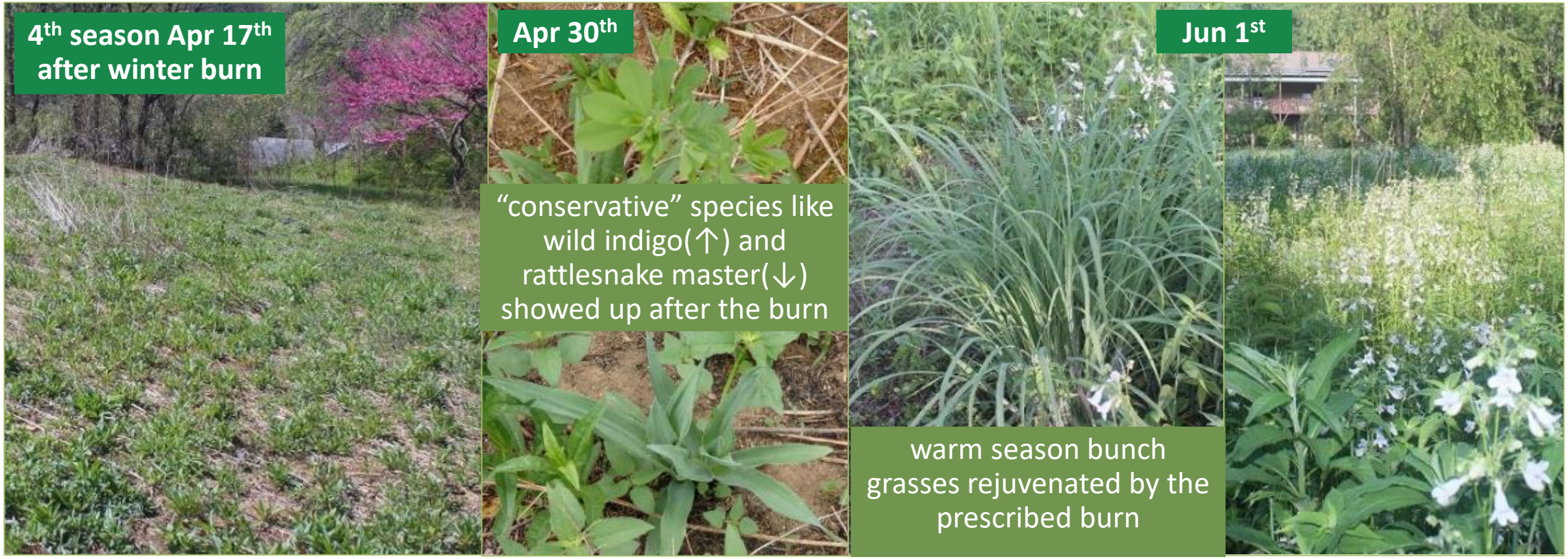
What will a meadow planting look like after a burn*?

Long term: Monitor for weeds and cut out or spot treat. Use prescribed fire, if possible.



Hop'n Blueberry Farm, Black Mountain, NC

Photos by Van Burnette.

*Can't use prescribed fire? Remove thatch from mowing (consider using thatch to seed other sites).

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Photo by Dave Kastner

Beneficial Conservation Practices through Farm Bill Programs

Habitat conditions have been evaluated.

1: Conditions warrant establishment of habitat resources

Conservation Practice Examples / Programs that may apply:

EQIP Environmental Quality Incentives Program

Establishment:

- Wildlife Habitat Planting (420)
- Conservation Cover (327)
- Field Border (386)
- Hedgerow (422)
- Tree & Shrub Establishment (612)
- Riparian Herbaceous Buffer (390)
- Cover Crop (340)
- Integrated Pest Management (595)

Facilitating/Management:

- Brush Management (314)
- Herbaceous Weed Treatment (315)
- Prescribed Burning (338)
- Firebreaks (394)

CSP Conservation Stewardship Program:

- E327B Establish Monarch butterfly habitat
- E386D Enhanced field borders to increase food for pollinators along the edge(s) of a field
- E512I Establish pollinator and/or beneficial insect and/or monarch habitat

ACEP (WRE, ALE)

Agricultural Conservation Easements:

Land protection, wetland restoration, farmland protection

Conservation Cover (327) and Wildlife Habitat Planting (420): Establish perennial native plants (native wildflowers targeting monarchs/pollinators and native plant community restoration).

Established plugs: *Liatris and Aristida*

Some projects include both herbaceous seed mixes and flowering woody species

Most projects are established with native seed mixes

Liatris, Monarda, Helianthus, Asclepias and Rudbeckia are preferred by monarchs

Pollinator habitat plot established in converted fescue/Bahia field

Conservation Cover Practice Standard (327): Establish permanent vegetation.

Saluda County, SC

CSP- Enhancement: Conservation Cover Practice Standard (327): Establish permanent vegetation.

Pollinator habitat plots established in converted former “food plot” areas

Sumter County, SC

Pollinator strips established between crop fields

EQIP Conservation Cover on working farm/demo and training for NRCS staff (Rosebank Farm, Charleston County, SC)

Conservation Cover 3 sites

EQIP, 327
Dorchester Co.

Pollinator habitat plots established in disturbed areas

CSP, 327 Sumter County

Monarch habitat plot established on small farm

EQIP, 327 Lee County

Conversion of a 6-ac. fescue pasture to native forbs and grasses as part of WRP easement and restoration

Edgefield County, SC

Some planting guidance:

Control Competitive Vegetation Before Planting: Conventional seedbed preparation, prescribed burning, herbicide application or a combination may be needed to control competition prior to planting. Seed bed should be firm (culti-pack or roll prior to seeding and then again after seeding to press the seed into the soil).

For pollinator habitat or high forb content plantings, broadcast seeding may be more successful since small seeds may be planted too deeply with a drill. *Fertilizer or other soil amendments are not recommended*. Good seed to soil contact is extremely important. *Never Plant seeds deeper than ¼ inch.* Broadcast at a half rate and seed over the area twice with the second pass at a right angle to the first pass to insure equal coverage.

Planting Dates			
Time	**From**	**To**	**Recommended for**
Frost seeding	February 1	March 15	Native grasses, wildflowers
Spring seeding	March 15	June 1	Native grasses
Fall seeding	September 1	October 20	Wildflowers, live herbs
Dormant seeding	November 15	freeze	Trees, shrubs, wildflowers, live herbs
Winter	freeze	March 15	Trees, shrubs

On sites where weeds have been eliminated and are completely dead by fall, forb seed can be planted in late fall by hand or drill with no soil tillage (seed will work its way down as the soil freezes and thaws over winter).

Signs may protect from accidental destruction

Nurse crop rates (nurse crop NOT required but may be beneficial on sites prone to erosion**), only use light rates** (high rates will compete with and possibly smother desired plants)		**Carriers: (mix with seed to broadcast or drill – use at least 3 times the amount of seed)**	
Oats, Annual Rye Grain, Barley, Buckwheat	Less than 20 lbs. per acre	sawdust	cracked corn
Brown-top millet	Less than 8 lbs. per acre	sand	pelletized lime
Do not use: winter wheat, winter rye, perennial rye, or introduced clovers		Soy or rice hulls	cat litter (clay bentonite)

Habitat conditions have been evaluated.

2: Potential to enhance native seed bank through management

Conservation Practice Examples / Programs that may apply:

EQIP Environmental Quality Incentives Program

- Forest Stand Improvement for wildlife (666)
- Prescribed Burning (338)
- Brush Management (314)
- Herbaceous Weed Treatment (315)
- Firebreaks (394)
- Wetland Restoration (657)

CSP Conservation Stewardship Program:

- E338A Strategically planned, patch burning for grazing distribution and wildlife habitat
- E666D Forest management to enhance understory vegetation
- E315A Herbaceous weed treatment to create desired plant communities consistent with the ecological site
- E314A Brush management to improve wildlife habitat

ACEP (WRE, ALE)

Agricultural Conservation Easements:

Land protection, wetland restoration, farmland protection

NRCS Conservation Practices

Forest Stand Improvement through tree density / shade reduction

<u>In pine stands thin to 40-60 Sq. Ft. per acre Basal Area</u>

(Basal Area is the area occupied by tree stems or total cross-sectional area of all stems in a stand measured at breast height)

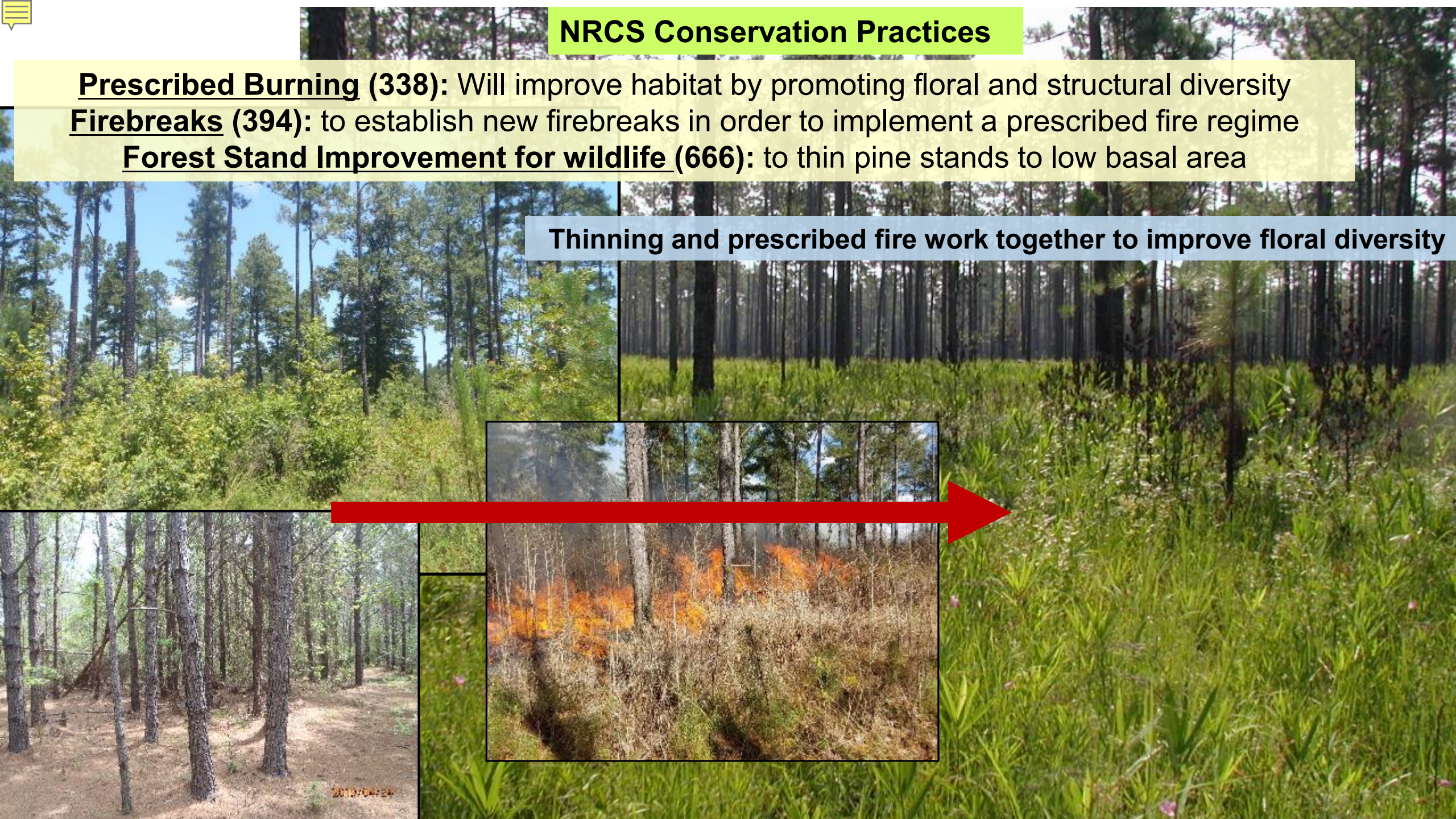
<u>- Can also create snags by girdling trees to increase sunlight.</u>

Sunlight will stimulate native herbaceous wildflowers and low flowering shrubs to germinate and bloom. Native grasses will spread to offer cover/structure and fire fuel. Regular prescribed fire enhances this practice.

NRCS Conservation Practices

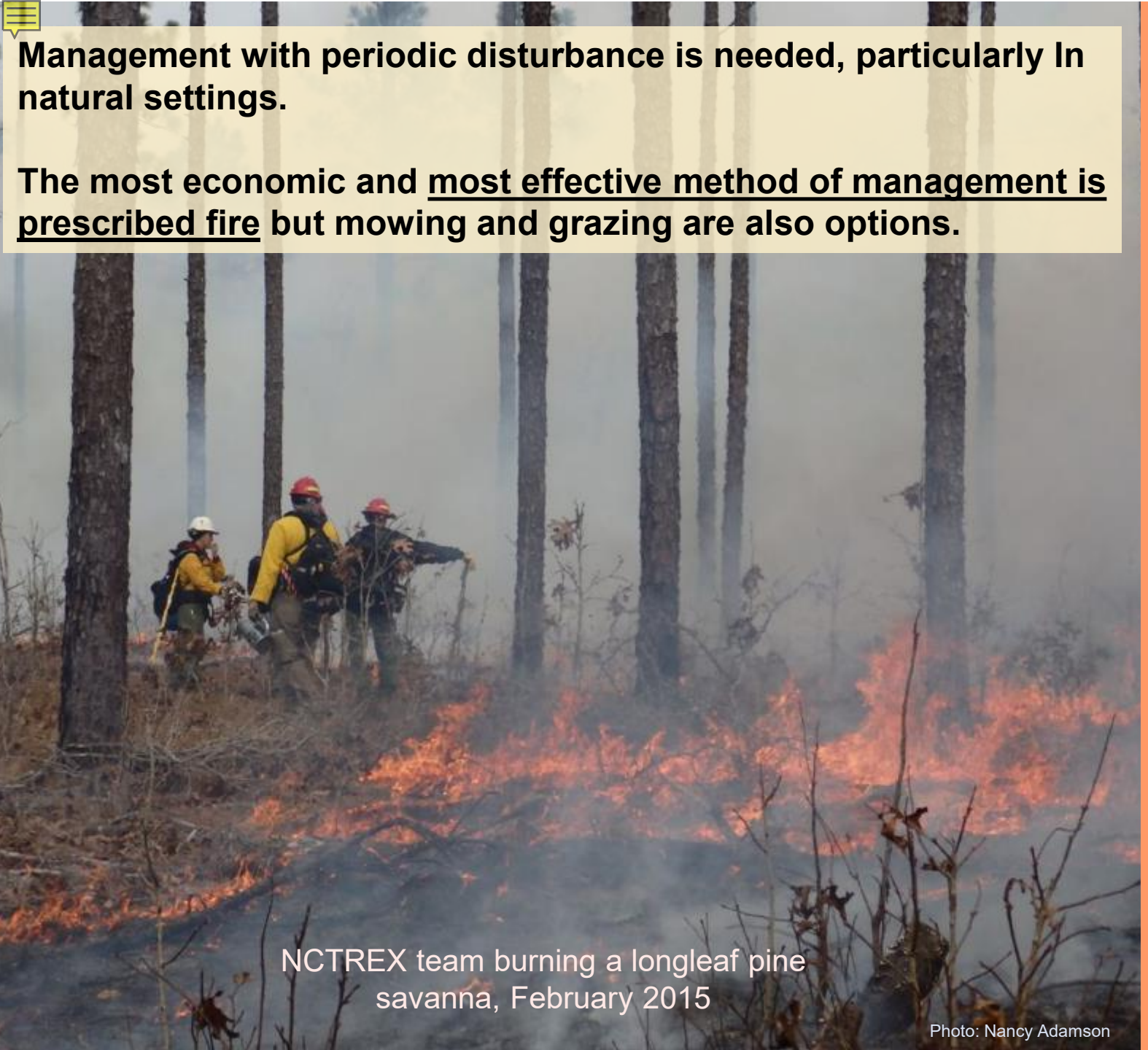
Prescribed Burning (338): Will improve habitat by promoting floral and structural diversity
Firebreaks (394): to establish new firebreaks in order to implement a prescribed fire regime
Forest Stand Improvement for wildlife (666): to thin pine stands to low basal area

Thinning and prescribed fire work together to improve floral diversity



Management with periodic disturbance is needed, particularly In natural settings.

The most economic and most effective method of management is prescribed fire but mowing and grazing are also options.



NCTREX team burning a longleaf pine savanna, February 2015

Photo: Nancy Adamson

- **Periodic, targeted disturbance re-sets succession, reducing woody plant coverage and competition**
- **Some seeds needs fire (smoke) to germinate.**
- **Fire stimulates many herbs to grow more flowering stems (which leads to more flowers and seeds)**
- **Rotational disturbance is best - burning about 30% of an area at a time, leaving refugia for insect larvae, pupae, and adults.**
- **Leave small unburned patches within the burned areas (habitat mosaic).**
- **Burn every 2-3 years.**
- **Implement prescribed burns outside the blooming period in foraging habitat (i.e., burn in late fall or early spring; March through May best for wild turkey; and early or late in the day).**
- **Recommendation to burn areas in 1/3rds. Blocks of <60 acres best for ground nesting birds including bobwhite and wild turkey.**

Prescribed Fire

WRP site/ burned understory Allendale County, SC

Diverse plant communities provide resources for monarchs and other beneficial insects

Incorporating prescribed fire improves habitat by reducing leaf litter and shade stimulating groundcover growth that offers nectar and pollen to migrating monarchs, particularly in the fall.

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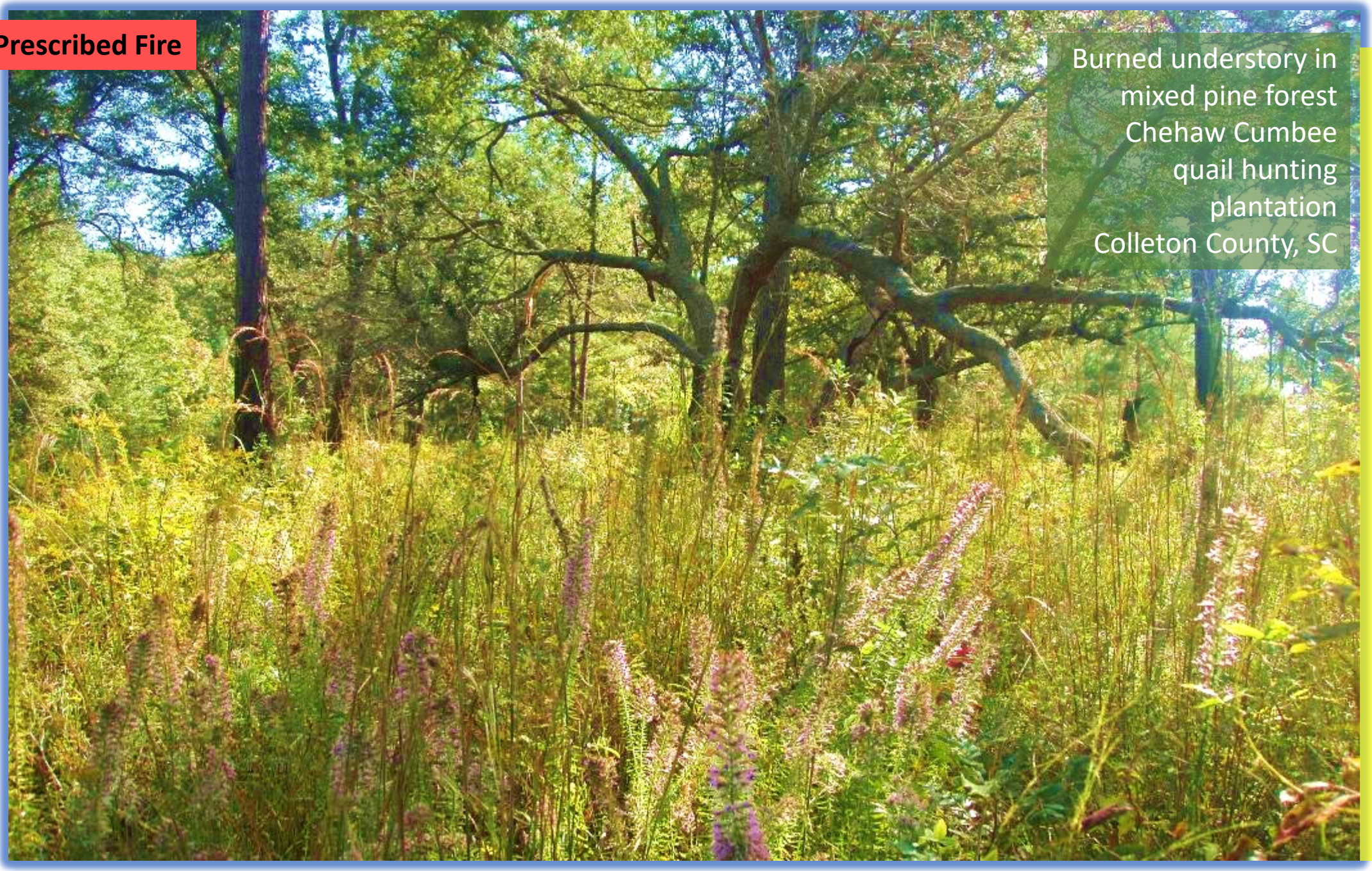
Prescribed Fire



Burned understory in mixed pine forest
Chehaw Cumbee quail hunting plantation
Colleton County, SC

Diverse plant communities provide resources for monarchs and other beneficial insects

Diverse plant communities provide resources for monarchs and other beneficial insects

Prescribed Fire

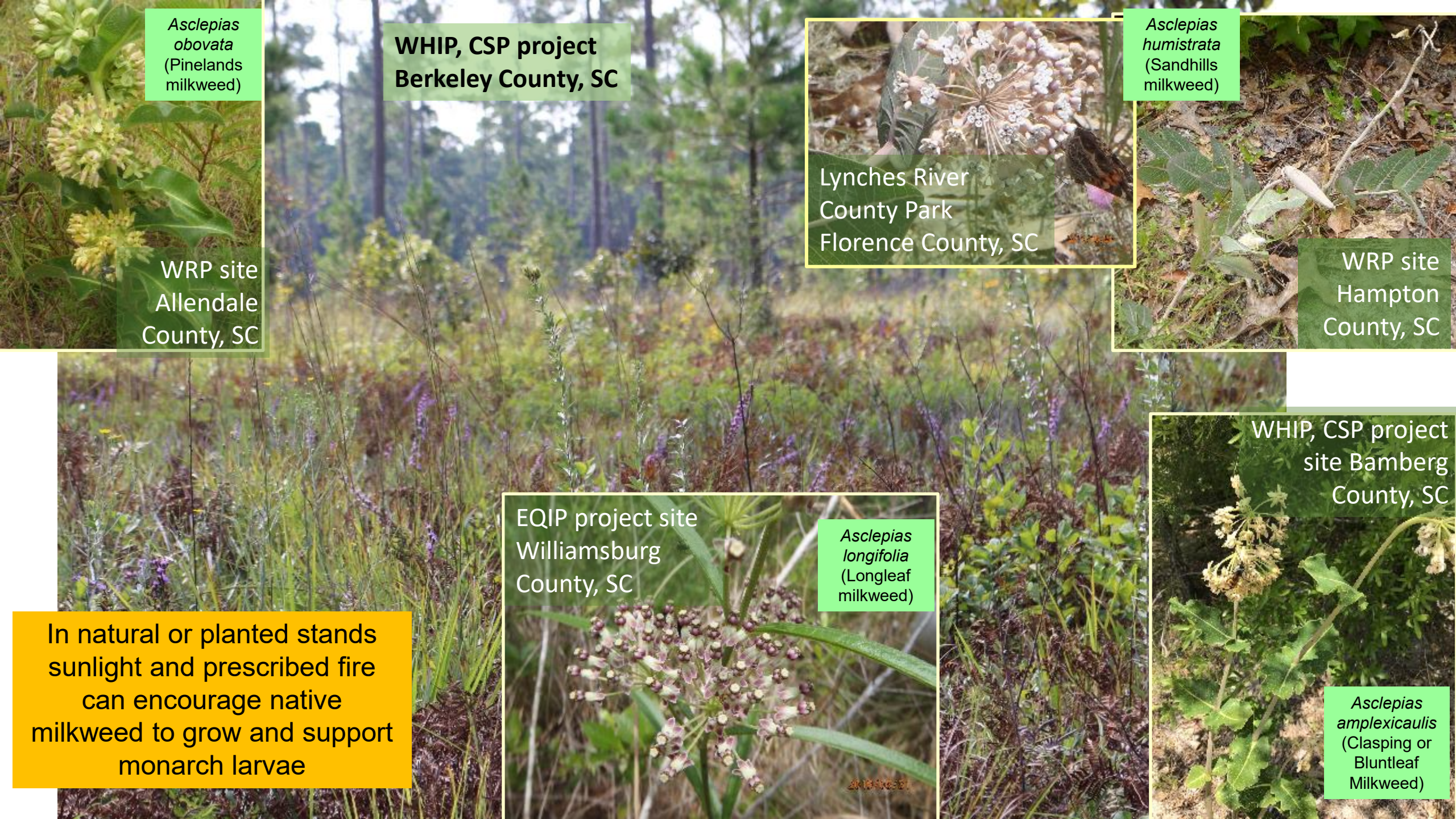
Burned understory in transitional forest,
Congaree Swamp National Park
Richland County, SC

WHIP, EQIP project/burning
Dorchester County, SC

Prescribed Fire

WHIP, CSP project
Grimke Plantation
Berkeley County, SC

Diverse plant communities provide resources for monarchs and other beneficial insects


Asclepias obovata (Pinelands milkweed)
WHIP, CSP project Berkeley County, SC
Lynches River County Park Florence County, SC
Asclepias humistrata (Sandhills milkweed)
WRP site Allendale County, SC
WRP site Hampton County, SC
EQIP project site Williamsburg County, SC
Asclepias longifolia (Longleaf milkweed)
WHIP, CSP project site Bamberg County, SC
Asclepias amplexicaulis (Clasping or Bluntleaf Milkweed)
In natural or planted stands sunlight and prescribed fire can encourage native milkweed to grow and support monarch larvae

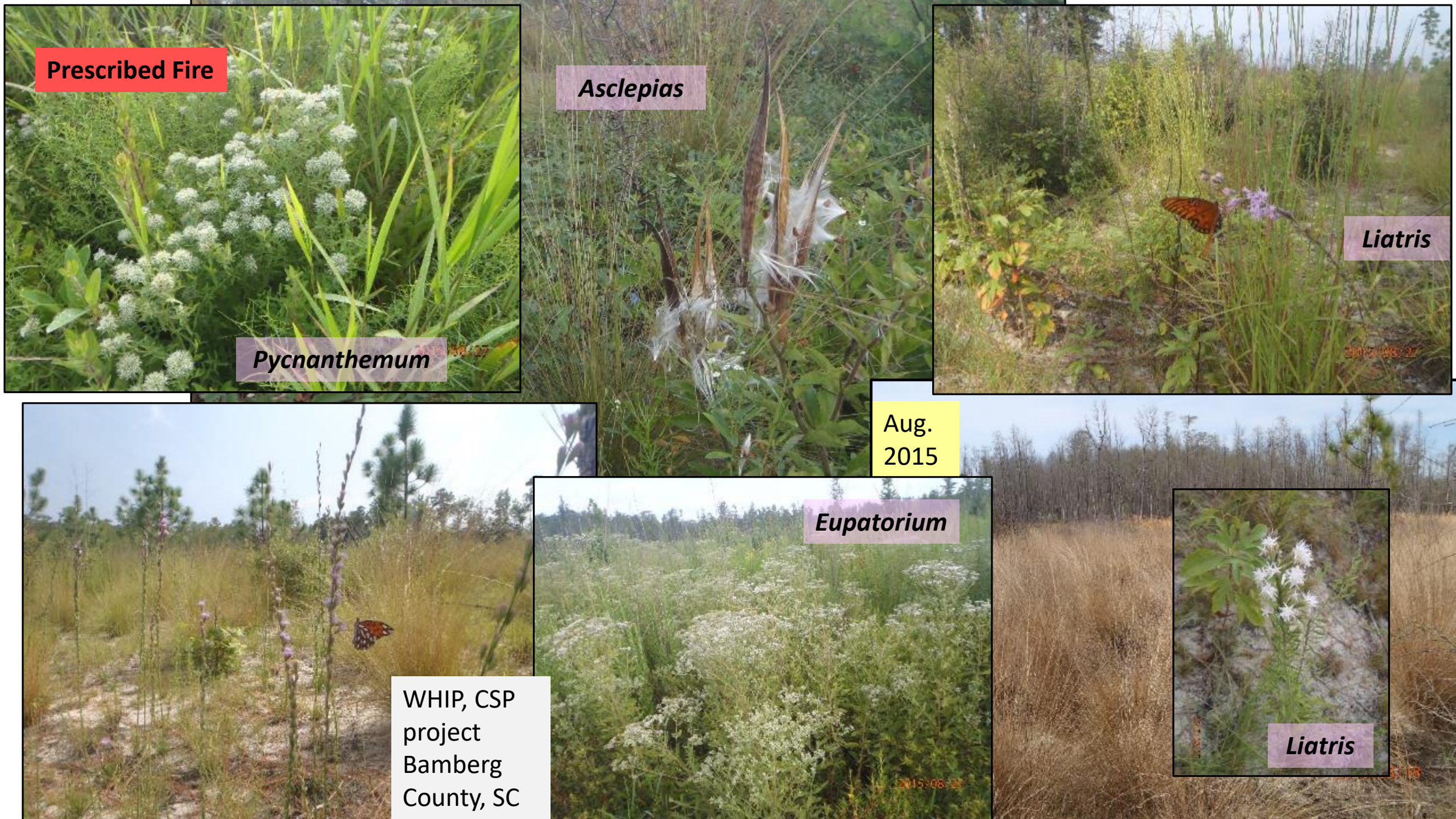
Prescribed Fire

WHIP, CSP project Bamberg County, SC

Established wiregrass and wildflowers via plugs after removal of dense pine timber stand

April 2015

Lisa Matthews Memorial Bay, owned by the SC Native Plant Society


Prescribed Fire
Pycnanthemum
Asclepias
Liatris
Aug. 2015
Eupatorium
Liatris
WHIP, CSP project Bamberg County, SC

Prescribed Fire

January 2018

WHIP, CSP project Bamberg County, SC

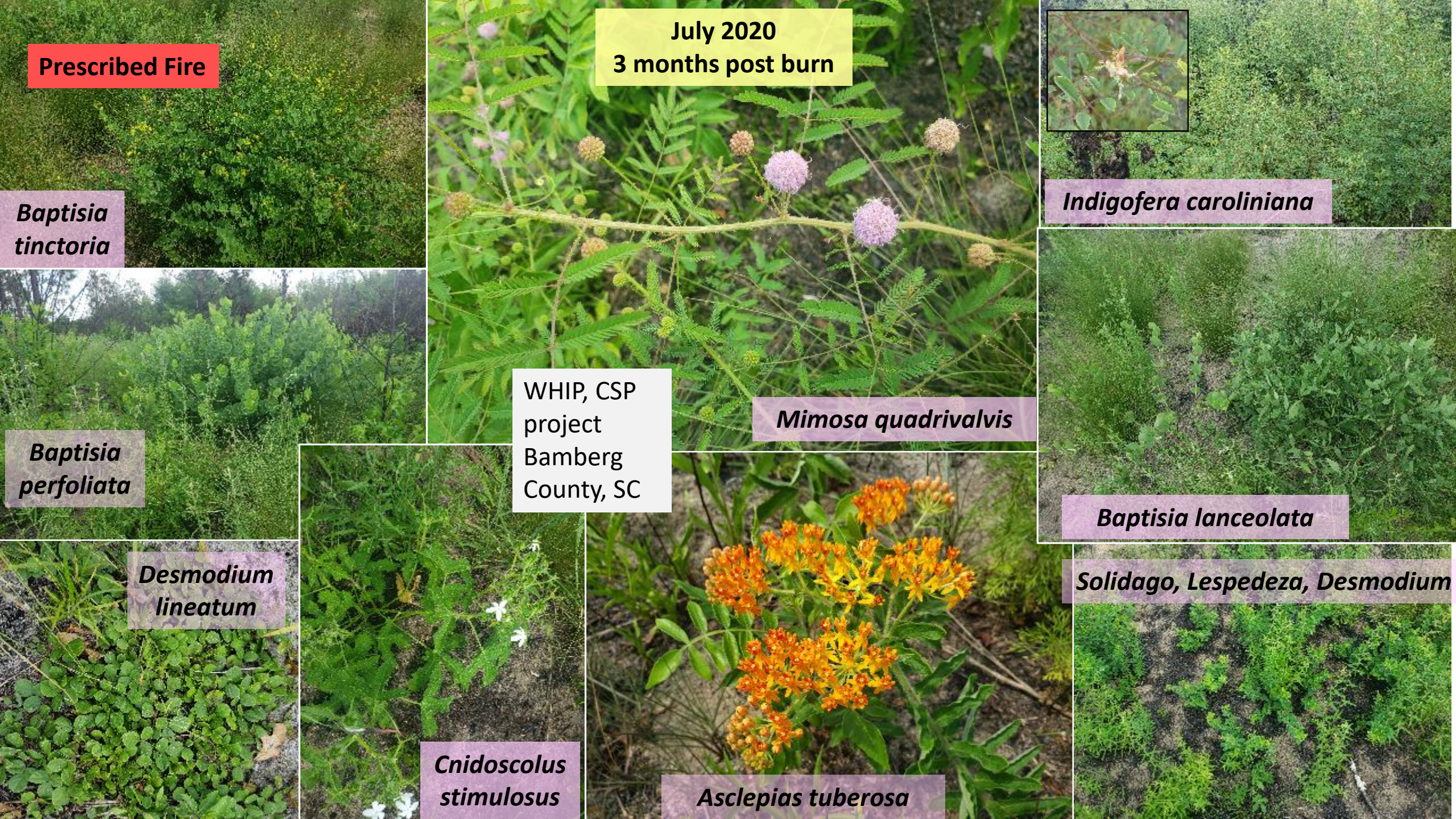
WHIP, CSP project Bamberg County, SC

Prescribed Fire

Prescribed burn May 2020

WHIP, CSP project Bamberg County, SC

Also occasional Brush Management of woodies (sweetgum, oak, black cherry)


Prescribed Fire
July 2020
3 months post burn
Baptisia tinctoria
Indigofera caroliniana
Baptisia perfoliata
WHIP, CSP project Bamberg County, SC
Mimosa quadrivalvis
Baptisia lanceolata
Desmodium lineatum
Solidago, Lespedeza, Desmodium
Cnidoscolus stimulosus
Asclepias tuberosa

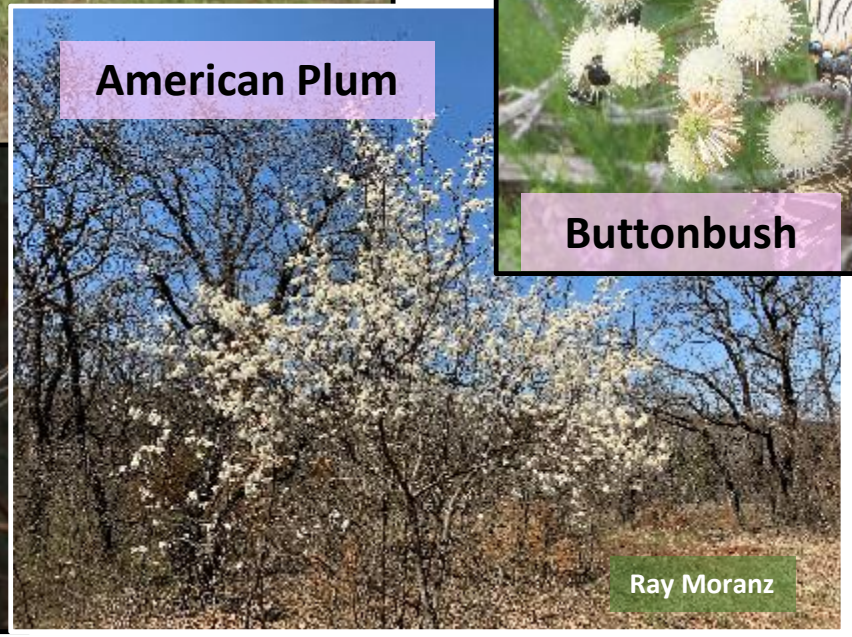
Field Border (386): Establish a diverse mix of native and low-cost non-native plants at crop field edges.

NRCS Conservation Practices

Can include host plant (milkweed) and nectar plant species preferred by monarch

Filter Strip (393): Establish herbaceous vegetation at crop field edges to address water quality and sedimentation near sensitive areas.

NRCS Conservation Practices



Tree & Shrub Establishment (612) or Hedgerow (422) Plant native flowering trees and shrubs known to be preferred by monarch. **Also for longleaf habitat restoration**/groundcover or understory herb community

NRCS Conservation Practices

Brush Management (314): Will improve habitat by removing or reducing the coverage of problematic woody exotic invasive plant species such as these:


Elaeagnus spp.


Chinese wisteria

Callery/Bradford pear


Tallow/popcorn tree


trifoliate orange


Chinese privet

Chinese Privet removal

Released the understory plant community in the Wateree River floodplain at Mulberry Plantation in Kershaw County, SC

chinaberry

NRCS Conservation Practices

Herbaceous Weed Treatment (315): can facilitate site prep for establishment of native wildflowers and will improve habitat by removing or reducing the coverage of problematic herbaceous exotic invasive plant species like these:

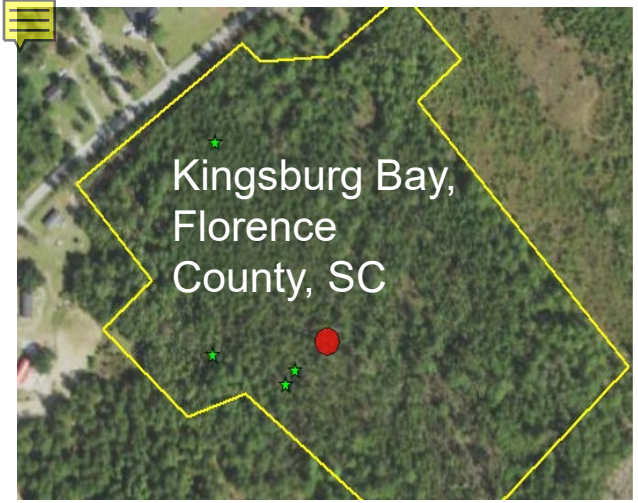
NRCS Conservation Practices

Wetland Restoration (657): restore degraded wetlands via returning microtopography to farmed and leveled land and blocking drainage ditches to improve soil condition to support native plant communities

The aerial map shows the ditches that drain the land into Douglas Swamp on the Smith site.

Restoration may entail plugging ditches in multiple locations, creating microtopography, thinning or removing planted pines, planting hardwoods and native wetland herbs, planting long-leaf pine in appropriate areas; management may include removal of exotic invasive plant species, prescribed burning.

NRCS Conservation Practices



Wetland Restoration: restore degraded wetlands and associated plant communities

- via vegetation management/facilitating practices (*forest stand improvement to reduce loblolly encroachment, prescribed burning, brush management to remove exotic invasive species, planting native species, etc.*)

CSP

Goals to restore to previous open meadow condition encouraging growth of rare plants and species beneficial for monarchs and other insects

Some milkweed species prefer shady wooded habitats and wetlands. The best sustaining practices for these may be wetland restoration and/or land protection (ACEP/WRE) or partner land protection

Photograph courtesy of Craig Sasser

Monarch using *Asclepias perennis* on a WRP easement property

WRP/WRE

Asclepias perennis (aquatic milkweed) known on 2 WRP sites in SC but most likely occurs on more, just need to find it!

Packera sp. **in the swamp, preferred nectar**

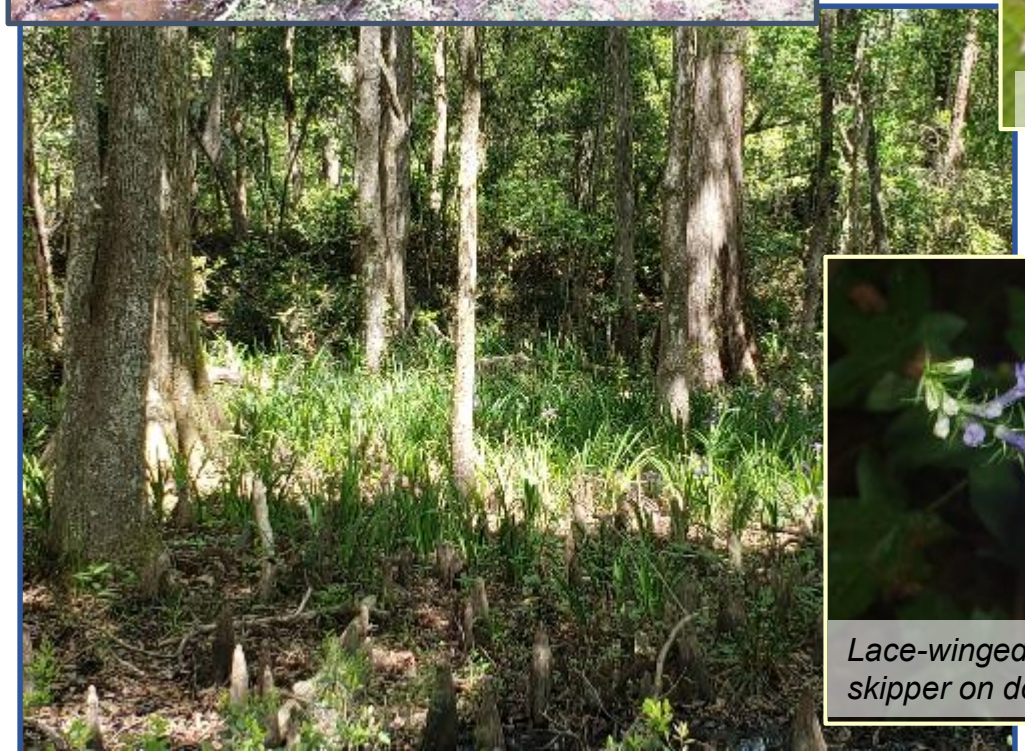
Asclepias variegata (Redring or White-flowered Milkweed) found on WRP site in Clarendon County

NRCS Conservation Practices

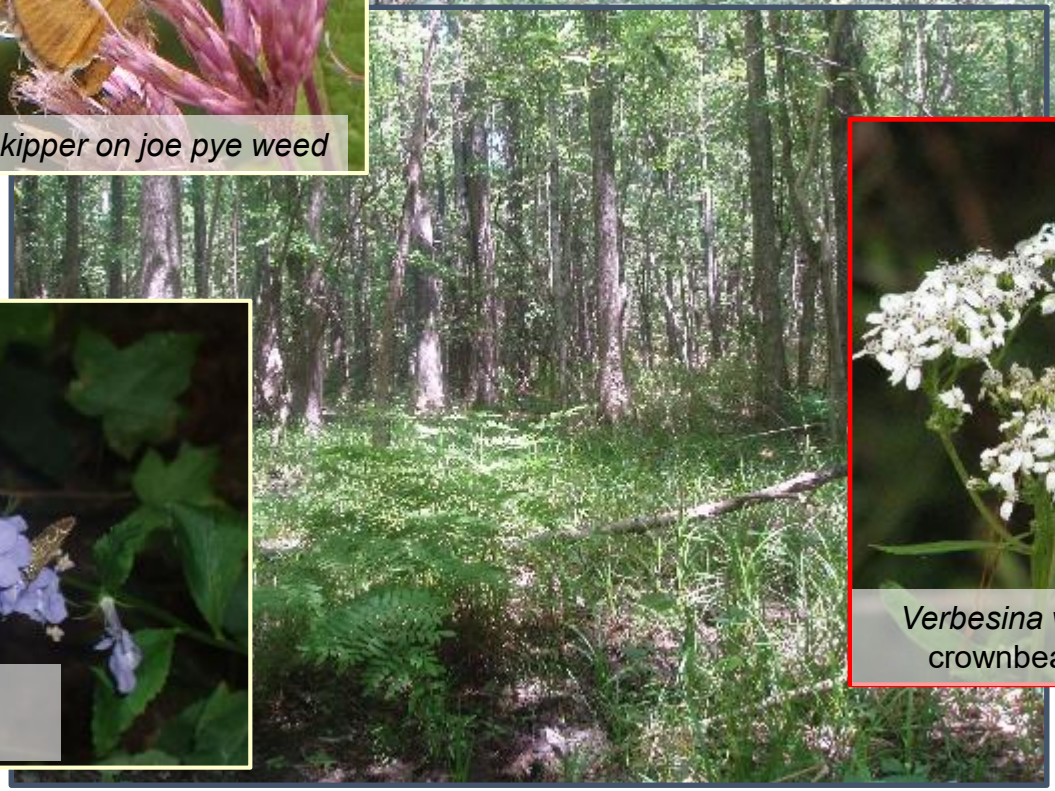
Land Protection through easement programs/Wetland Restoration (657) protect potential monarch resources

Texan Crescent (rare) on meadow beauty

Byssus skipper on joe pye weed



Lace-winged roadside skipper on downy lobelia



Verbesina virginica (white crownbeard, frostweed)

NRCS Conservation Practices

Cover Crop Practice Standard (340): Can include diverse flowering forbs such as clover, mustard, buckwheat, phacelia, oilseed/tillage radish, vetch

Photos: Matthew Anderson

Depending the crop being planted and how early the cover crop was planted, bloom may occur for a few weeks before termination. If planted early and followed with soybeans or cotton it may bloom for 4-8 weeks

Integrated Pest Management (595)

- Protecting pollinators from pesticides
- Establishing habitat for other beneficial insects

Photos: David Biddinger (Penn State University), Mace Vaughan (Xerces Society), and Elise Fog

NRCS Conservation Practices

Other practices:

- Early Successional Habitat Management
- Riparian Herbaceous Buffer
- Riparian Forest Buffer
- Prescribed Grazing (Ray)

Photo: Dave Kastner

For monarchs, avoid mowing during migration

For all wildlife habitat management, **avoid disturbing more than 1/3 of habitat at any one time***
Same for roadside management—local governments may delay mowing if requested

Photos: Panorama by Anthony Burns, monarch on narrowleaved sunflower by Nancy Lee Adamson, monarch recently eclosed on little bluestem by Brittney Viers

*The exception is fire—you may need to burn the whole area given the opportunity (right conditions and schedule), but long-term benefits and, hopefully, patchiness of burn, outweigh any potential short-term drawbacks.

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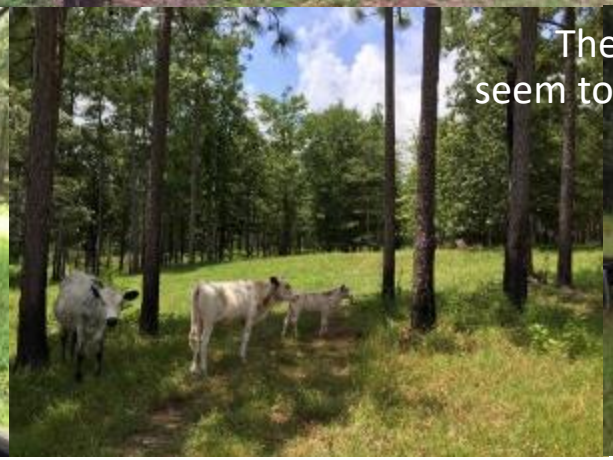
In cow/calf operations, thinning/burning supports diversity, maintains some shade



These “piney woods” cattle seem to prefer the shade unless they need water

Beautyberry in fruit after burn

Mr. Malone uses brush management, prescribed burning, and prescribed grazing to restore understory diversity and maintain some shade for his cow/calf operation.

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Potential Impacts of Grazing

Green antelopehorn milkweed (*Asclepias viridis*) thriving in rangeland grazed by bison

Photo: Ray Moranz

xerces.org

Potential Impacts of Grazing

antelopehorn milkweed (*Asclepias viridis*) thriving in rangeland grazed by bison

Photo: Ray Moranz

xerces.org

Potential Impacts of Grazing

Green antelopehorn milkweed (*Asclepias viridis*) in cattle-grazed range

Photo: Ray Moranz

Potential Impacts of Grazing

Green antelopehorn milkweed (*Asclepias viridis*) thriving in cattle-grazed range

Photo: Ray Moranz

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FL cattle pasture with sandhill milkweed (*Asclepias humistrata*)

Figure 2. View across Hogan's pasture showing numerous flowering *Asclepias humistrata* plants. 28 April 2010. Photo by K. Sims Dunford.

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Are Milkweeds Compatible with Grazing?

- Cardenolides make some milkweeds toxic to vertebrates
- Scientists at USDA toxic plant research center in Logan, UT report that they almost never receive reports of livestock losses due to milkweeds !!
- Cardenolide concentrations vary greatly by species
- Cardenolides taste bitter
- Cattle usually refrain from eating milkweeds with high concentrations of cardenolides

Table IV. Cardenolide content in the leaves of 31 North American and two African *As*
range and N), ranked according to mean cardenolide concentration (μg cardenolide/0.1

	Cardenolide concentration			
Asclepias species	Mean	SD	V	Range
North American				
1. *A. masonii*	7,910	9,603	121	1,120–14,700
2. *A. albicans*	2,845	3,770	133	179–5,510
3. *A. subulata*	1,641	1,866	114	321–2,960
4. *A. subaphylla*	1,323	788	60	765–1,880
5. *A. curassavica*	1,055	450	43	232–1,641
6. *A. asperula*	886	255	29	341–1,616
7. *A. linaria*	778	—	—	—
8. *A. vestita*	750	516	69	88–1,718
9. *A. nivea*	682	294	43	287–1,362
10. *A. erosa*	562	338	60	79–2,102
11. *A. labriformis*	467	358	77	214–720
12. *A. humistrata*[d]	432	126	29	216–710
13. *A. eriocarpa*	421	170	40	102–919
12. *A. humistrata*[e]	389	141	36	71–639
14. *A. viridis*[f]	376	203	54	148–972
14. *A. viridis*[g]	245	70	29	95–433
15. *A. speciosa*	90	65	72	19–344
16. *A. cordifolia*	73	44	60	19–238
17. *A. californica*	66	45	68	9–199
18. *A. syriaca*	50	39	78	4–229
19. *A. exaltata*	~39	—	—	13–64

Source: Malcolm 1991

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Are Milkweeds Compatible with Grazing?

Cardenolide concentrations of 7 milkweed species

Species	Mean cardenolide concentration[1]
Asclepias perennis	1550
A. humistrata	432
A. viridis	376
A. syriaca	50
A. incarnata	14
A. tuberosa	3
A. verticillata	1

1: concentration in ug cardenolide/0.1 g dry leaf; Source: Malcolm 1992; Moranz and Brower 1998

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Are Milkweeds Compatible with Grazing?

Some milkweed species may need to be protected from livestock

Species	Mean cardenolide concentration[1]
Asclepias perennis	1550
A. humistrata	432
A. viridis	376
A. syriaca	50
A. incarnata	14
A. tuberosa	3
A. verticillata	1

1: concentration in ug cardenolide/0.1 g dry leaf; Source: Malcolm 1992; Moranz and Brower 1998

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Effects of cattle grazing on *Asclepias syriaca (in prep.)*

Timothy Dickson, Chris Helzer and Brittany Poynor (In Prep.)

- They compared grazed rangeland to ungrazed rangeland
- **Cattle ate plenty of the milkweeds**
- No adverse effects on cattle were observed

Photo: Tim Dickson

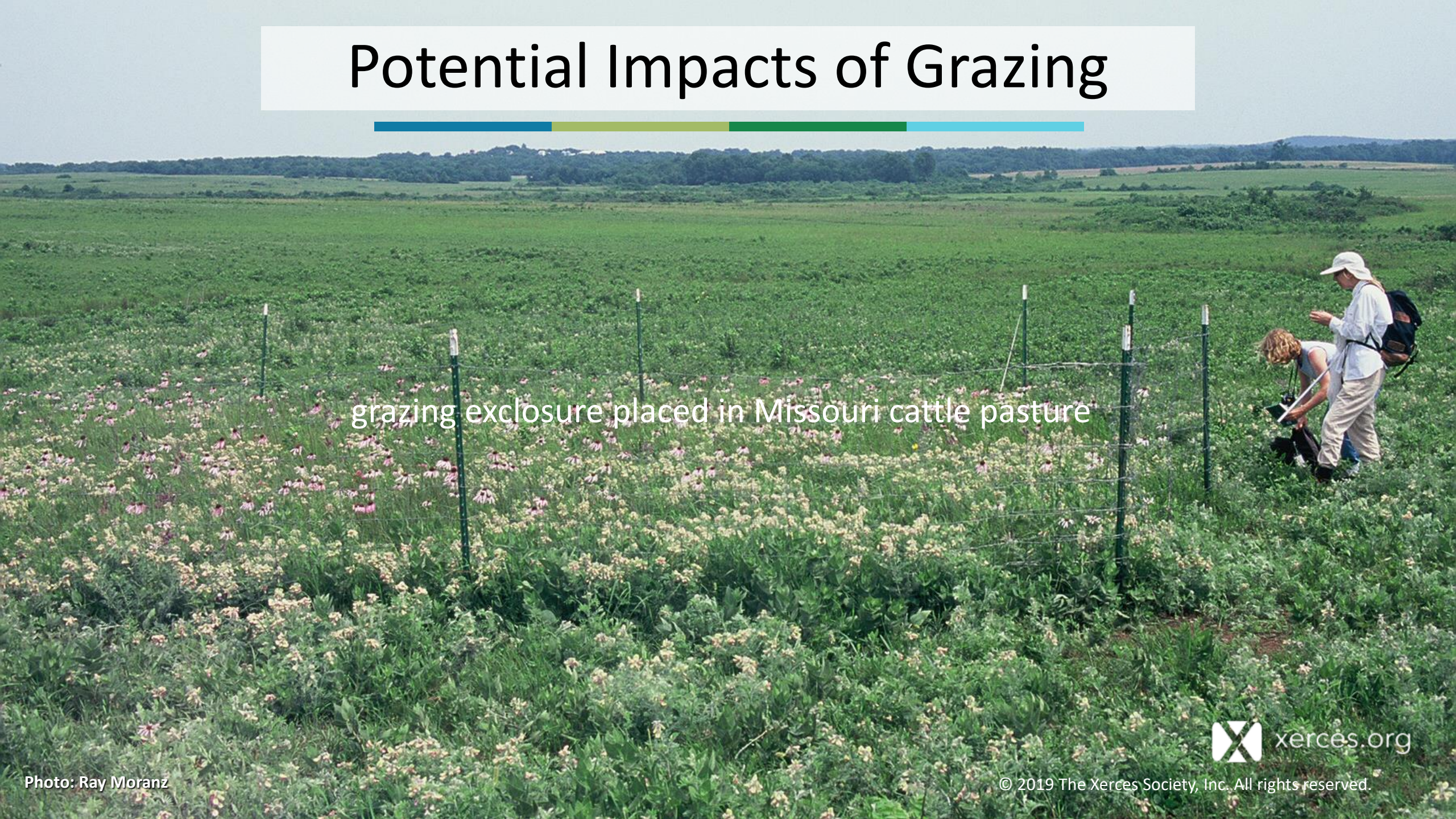
xerces.org

Potential Impacts of Grazing

Photo: Ray Moranz

xerces.org

Potential Impacts of Grazing



grazing exclosure placed in Missouri cattle pasture

Photo: Ray Moranz

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Potential Impacts of Grazing

Pale purple coneflower abounds within grazing exclosure placed in Missouri cattle pasture

Photo: Ray Moranz

xerces.org

Grazing - Best Management Practices

- Use proper stocking rate
- But what is the proper stocking rate?
- Allow time for plant recovery
- But what is the proper time for plant recovery?
- local NRCS staff should determine these based on the ability of milkweeds to grow and nectar plants to flower

Photo: Nancy Adamson

xerces.org

Using a seed calculator

Monarch Habitat Planting requirements (seeding)

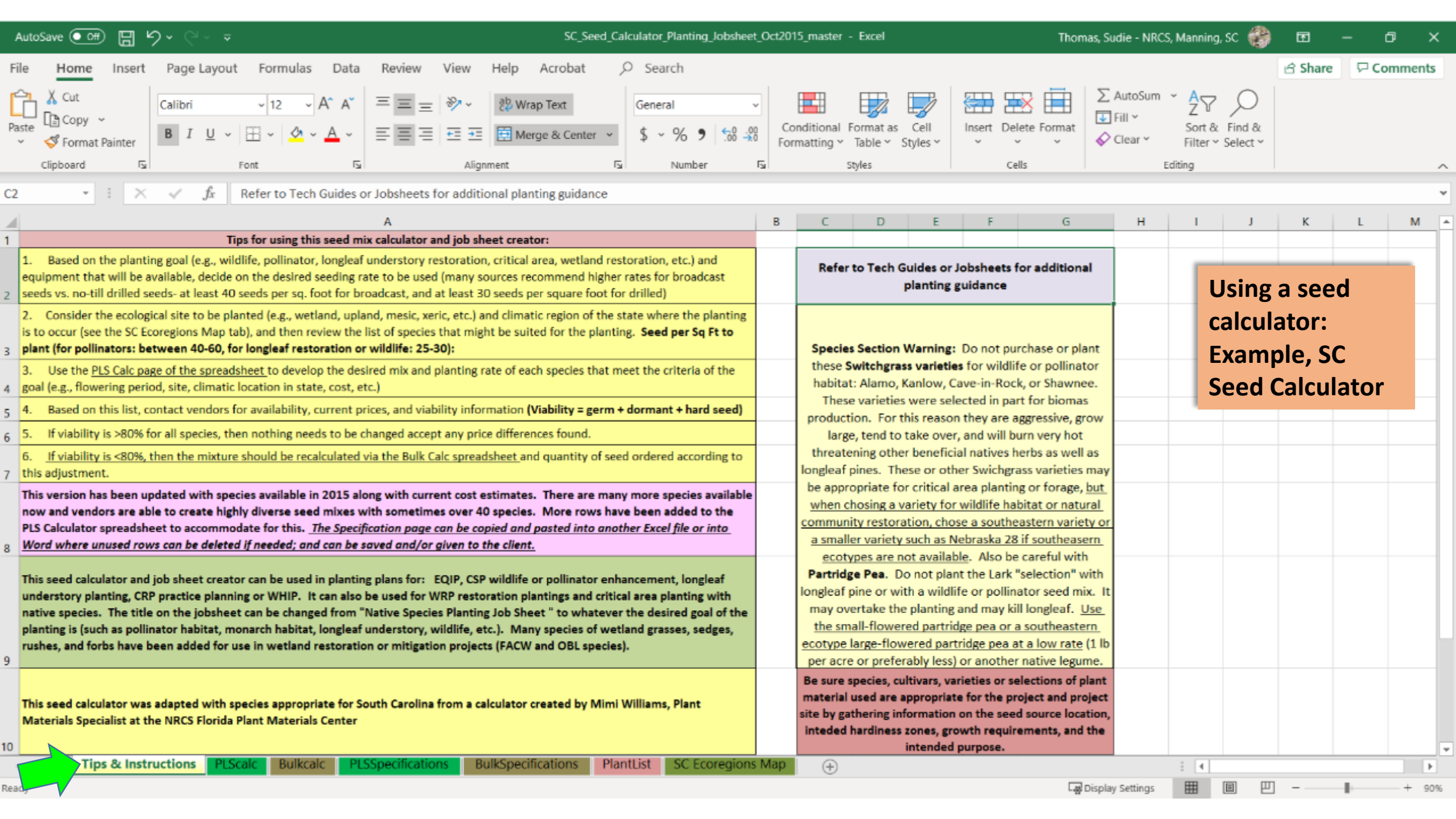
- Minimum 10 native herb species
- Local ecotype preferred
- 9 or more forbs
- 60% of mix must be forbs* preferred by monarchs (indicated in plant list and seed calculator)
- 3 or more species blooming per season (Spring, Summer, Fall)
- Minimum 1.8% of mix consists of *Asclepias* (milkweed)
- + 1 or more native grass species for structure and fire fuel
- 40-60 seeds per sq. ft. (use high end of range if seed broadcast)
- No species can be more than 20% of mix
- Plot size 1/2 – 2 ac

Native grasses are beneficial as structure for pupation. Grasses can also hold up tall wildflowers that tend to fall over

Seek out seed vendors that produce locally native species, NRCS Biologists, Native Plant Societies, or other conservation groups/partners may have this information for your area

Seed Calculator can assist to create appropriate seed mix complying with requirements

Seed specifications can be created with the calculator and presented to vendors as a starting point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Thomas, Sudie - NRCS, Manning, SC
File Home Insert Page Layout Formulas Data Review View Help Acrobat Search
Share Comments
Cut Copy Format Painter Paste
Calibri 12
Wrap Text
Merge & Center
General
Conditional Formatting
Format as Table
Cell Styles
Insert Delete Format
AutoSum Fill Clear
Sort & Filter
Find & Select
Clipboard Font Alignment Number Styles Cells Editing
C2
Refer to Tech Guides or Jobsheets for additional planting guidance
Tips for using this seed mix calculator and job sheet creator:
1. Based on the planting goal (e.g., wildlife, pollinator, longleaf understory restoration, critical area, wetland restoration, etc.) and equipment that will be available, decide on the desired seeding rate to be used (many sources recommend higher rates for broadcast seeds vs. no-till drilled seeds- at least 40 seeds per sq. foot for broadcast, and at least 30 seeds per square foot for drilled)
2. Consider the ecological site to be planted (e.g., wetland, upland, mesic, xeric, etc.) and climatic region of the state where the planting is to occur (see the SC Ecoregions Map tab), and then review the list of species that might be suited for the planting. Seed per Sq Ft to plant (for pollinators: between 40-60, for longleaf restoration or wildlife: 25-30):
3. Use the PLS Calc page of the spreadsheet to develop the desired mix and planting rate of each species that meet the criteria of the goal (e.g., flowering period, site, climatic location in state, cost, etc.)
4. Based on this list, contact vendors for availability, current prices, and viability information (Viability = germ + dormant + hard seed)
5. If viability is >80% for all species, then nothing needs to be changed accept any price differences found.
6. If viability is <80%, then the mixture should be recalculated via the Bulk Calc spreadsheet and quantity of seed ordered according to this adjustment.
This version has been updated with species available in 2015 along with current cost estimates. There are many more species available now and vendors are able to create highly diverse seed mixes with sometimes over 40 species. More rows have been added to the PLS Calculator spreadsheet to accommodate for this. The Specification page can be copied and pasted into another Excel file or into Word where unused rows can be deleted if needed; and can be saved and/or given to the client.
This seed calculator and job sheet creator can be used in planting plans for: EQIP, CSP wildlife or pollinator enhancement, longleaf understory planting, CRP practice planning or WHIP. It can also be used for WRP restoration plantings and critical area planting with native species. The title on the jobsheet can be changed from "Native Species Planting Job Sheet " to whatever the desired goal of the planting is (such as pollinator habitat, monarch habitat, longleaf understory, wildlife, etc.). Many species of wetland grasses, sedges, rushes, and forbs have been added for use in wetland restoration or mitigation projects (FACW and OBL species).
This seed calculator was adapted with species appropriate for South Carolina from a calculator created by Mimi Williams, Plant Materials Specialist at the NRCS Florida Plant Materials Center
Refer to Tech Guides or Jobsheets for additional planting guidance
Species Section Warning: Do not purchase or plant these Switchgrass varieties for wildlife or pollinator habitat: Alamo, Kanlow, Cave-in-Rock, or Shawnee. These varieties were selected in part for biomas production. For this reason they are aggressive, grow large, tend to take over, and will burn very hot threatening other beneficial natives herbs as well as longleaf pines. These or other Swichgrass varieties may be appropriate for critical area planting or forage, but when chosing a variety for wildlife habitat or natural community restoration, chose a southeastern variety or a smaller variety such as Nebraska 28 if southeasern ecotypes are not available. Also be careful with Partridge Pea. Do not plant the Lark "selection" with longleaf pine or with a wildlife or pollinator seed mix. It may overtake the planting and may kill longleaf. Use the small-flowered partridge pea or a southeastern ecotype large-flowered partridge pea at a low rate (1 lb per acre or preferably less) or another native legume.
Be sure species, cultivars, varieties or selections of plant material used are appropriate for the project and project site by gathering information on the seed source location, inteded hardiness zones, growth requirements, and the intended purpose.
Using a seed calculator: Example, SC Seed Calculator
Tips & Instructions
PLScalc
Bulkcalc
PLSSpecifications
BulkSpecifications
PlantList
SC Ecoregions Map
Ready
Display Settings
90%

Native Species Mixes and Cost Estimator (reduce spreadsheet size to 80-85% see more of spreadsheet)

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

Species names with * = preferred by Monarchs

scroll over for more info:

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	Growth Habit	Region in State	Wetland Status	Additional Information on Plant	Site Moisture Needs
Milkweed, Butterfly *	320	70,000	0.20	14,000	100%	sum	P	All	na	http://plants.usda.gov/plantguide	low

clepias tuberosa

Milkweed, Butterfly *
Milkweed, Common *
Milkweed, Eastern Swamp *
Mint, Clustered Mountain*
Mint, Hoary Mountain*
Mint, Lemon
Mint, Ohio / Downy Pagoda (NC ecotype)
Mint, Slender Mountain*

scroll down to add woody plants(trees, shrubs, vines) beneficial for pollinators and wildlife

Clear Data

Seed per Sq Ft (for *pollinators* needs to between 40-60, for *longleaf restoration* or *wildlife* between 25-30): 0.3

Total Lb per Acre of Mix Planted: 0.2

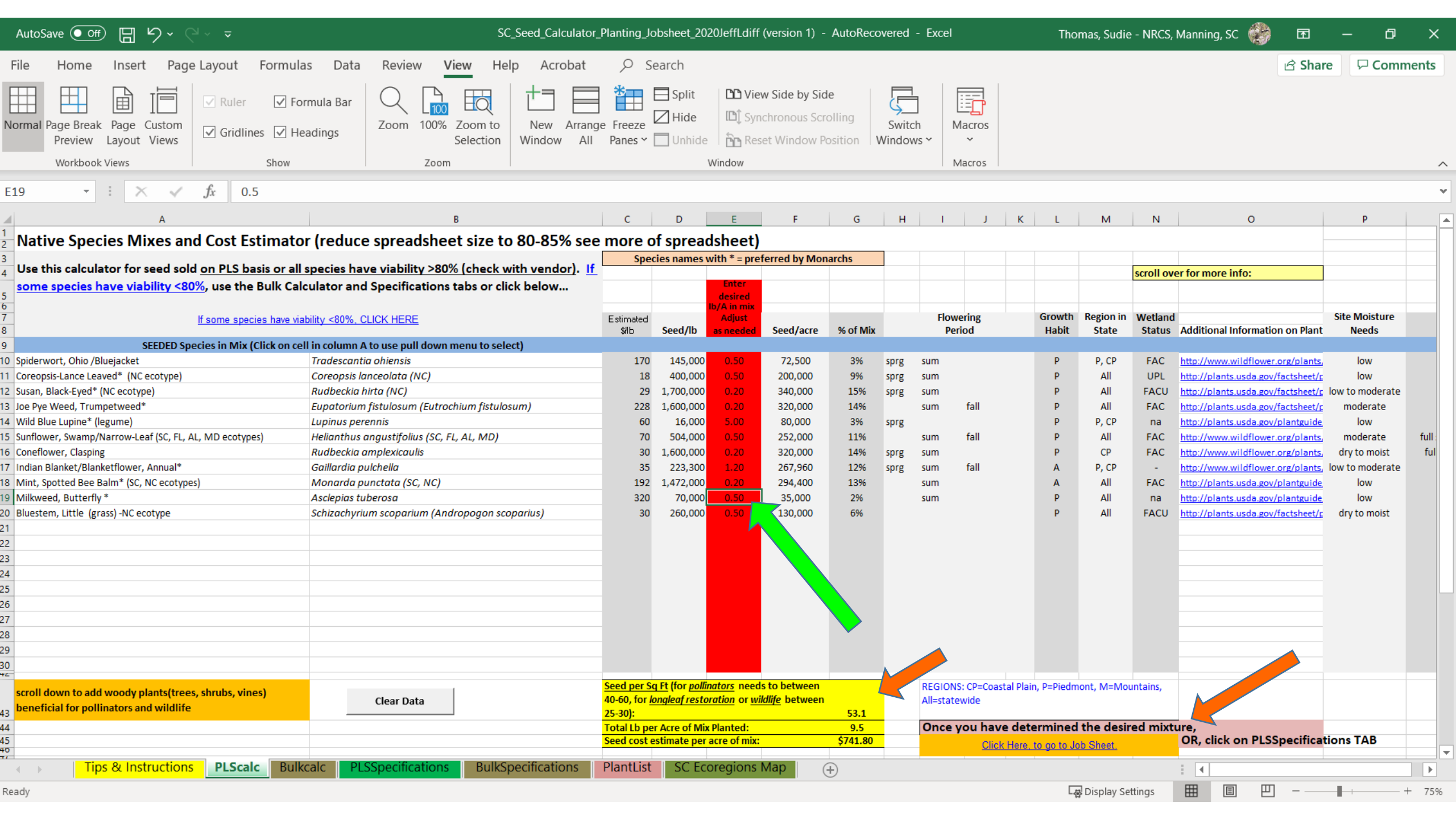
Seed cost estimate per acre of mix: $64.00

REGIONS: CP=Coastal Plain, P=Piedmont, M=Mountains, All=statewide

Once you have determined the desired mixture,

Click Here, to go to Job Sheet.

OR, click on PLSSpecifications TAB



Native Species Mixes and Cost Estimator (reduce spreadsheet size to 80-85% see more of spreadsheet)

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

Species names with * = preferred by Monarchs

scroll over for more info:

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			Growth Habit	Region in State	Wetland Status	Additional Information on Plant	Site Moisture Needs	
Spiderwort, Ohio /Bluejacket	*Tradescantia ohiensis*	170	145,000	0.50	72,500	3%	sprg	sum		P	P, CP	FAC	http://www.wildflower.org/plants,	low	
Coreopsis-Lance Leaved* (NC ecotype)	*Coreopsis lanceolata (NC)*	18	400,000	0.50	200,000	9%	sprg	sum		P	All	UPL	http://plants.usda.gov/factsheet/p	low	
Susan, Black-Eyed* (NC ecotype)	*Rudbeckia hirta (NC)*	29	1,700,000	0.20	340,000	15%	sprg	sum		P	All	FACU	http://plants.usda.gov/factsheet/p	low to moderate	
Joe Pye Weed, Trumpetweed*	*Eupatorium fistulosum (Eutrochium fistulosum)*	228	1,600,000	0.20	320,000	14%		sum	fall	P	All	FAC	http://plants.usda.gov/factsheet/p	moderate	
Wild Blue Lupine* (legume)	*Lupinus perennis*	60	16,000	5.00	80,000	3%	sprg			P	P, CP	na	http://plants.usda.gov/plantguide	low	
Sunflower, Swamp/Narrow-Leaf (SC, FL, AL, MD ecotypes)	*Helianthus angustifolius (SC, FL, AL, MD)*	70	504,000	0.50	252,000	11%		sum	fall	P	All	FAC	http://www.wildflower.org/plants,	moderate	full
Coneflower, Clasping	*Rudbeckia amplexicaulis*	30	1,600,000	0.20	320,000	14%	sprg	sum		P	CP	FAC	http://www.wildflower.org/plants,	dry to moist	ful
Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	35	223,300	1.20	267,960	12%	sprg	sum	fall	A	P, CP	-	http://www.wildflower.org/plants,	low to moderate	
Mint, Spotted Bee Balm* (SC, NC ecotypes)	*Monarda punctata (SC, NC)*	192	1,472,000	0.20	294,400	13%		sum		A	All	FAC	http://plants.usda.gov/plantguide	low	
Milkweed, Butterfly *	*Asclepias tuberosa*	320	70,000	0.50	35,000	2%		sum		P	All	na	http://plants.usda.gov/plantguide	low	
Bluestem, Little (grass) -NC ecotype	*Schizachyrium scoparium (Andropogon scoparius)*	30	260,000	0.50	130,000	6%				P	All	FACU	http://plants.usda.gov/factsheet/p	dry to moist	

scroll down to add woody plants(trees, shrubs, vines) beneficial for pollinators and wildlife

Clear Data

Seed per Sq Ft (for *pollinators* needs to between 40-60, for *longleaf restoration* or *wildlife* between 25-30): 53.1

Total Lb per Acre of Mix Planted: 9.5

Seed cost estimate per acre of mix: $741.80

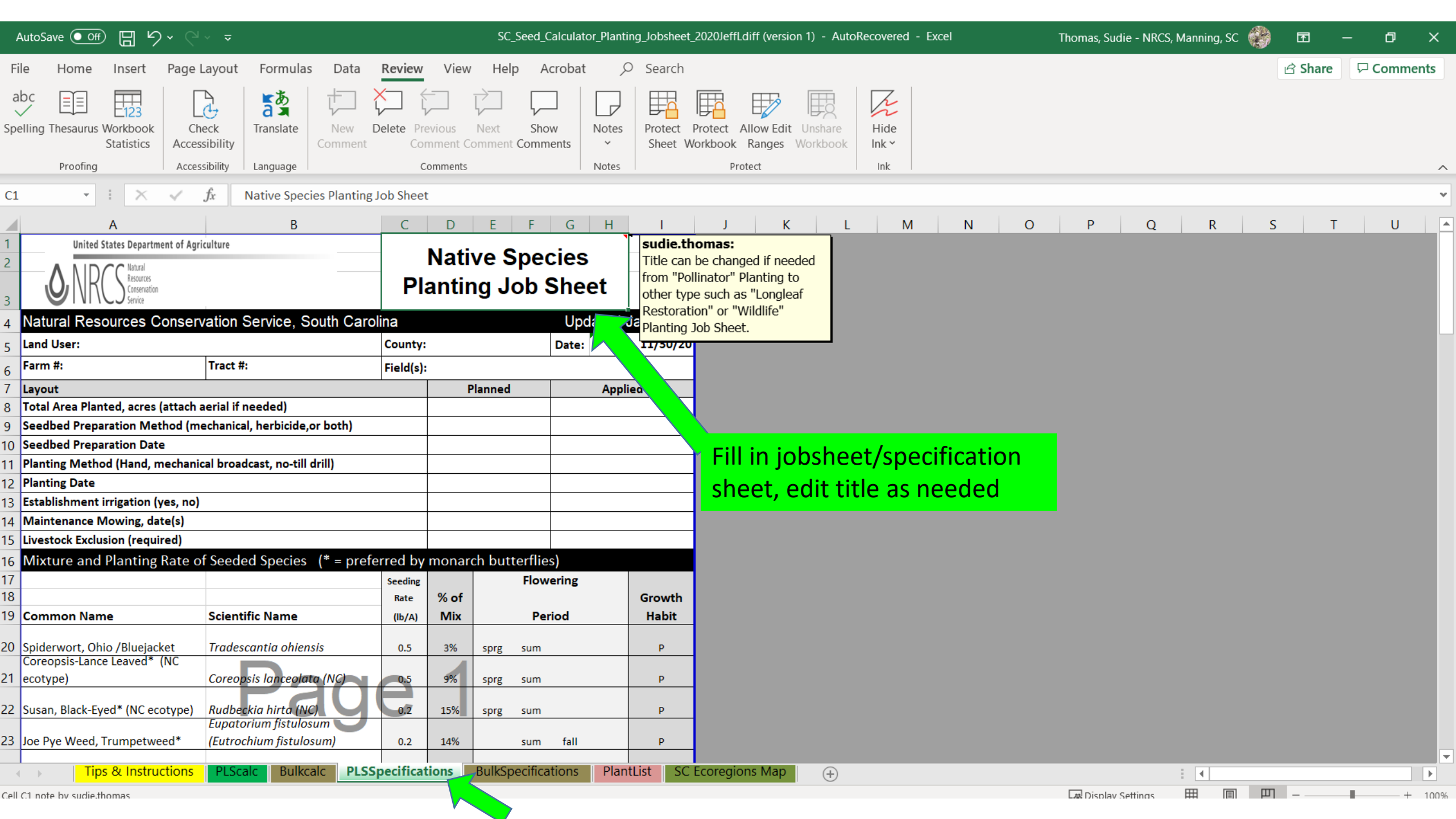
REGIONS: CP=Coastal Plain, P=Piedmont, M=Mountains, All=statewide

Once you have determined the desired mixture,

Click Here, to go to Job Sheet.

OR, click on PLSSpecifications TAB

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
19	Milkweed, Butterfly *	*Asclepias tuberosa*	320	70,000	0.50	35,000	2%		sum			P	All	na	http://plants.usda.gov/plantguide	low
20	Bluestem, Little (grass) -NC ecotype	*Schizachyrium scoparium (Andropogon scoparius)*	30	260,000	0.50	130,000	6%					P	All	FACU	http://plants.usda.gov/factsheet/p	dry to moist
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
43	scroll down to add woody plants(trees, shrubs, vines) beneficial for pollinators and wildlife	Clear Data	Seed per Sq Ft (for *pollinators* needs to between 40-60, for *longleaf restoration* or *wildlife* between 25-30):				53.1		REGIONS: CP=Coastal Plain, P=Piedmont, M=Mountains, All=statewide							
44			Total Lb per Acre of Mix Planted:				9.5		Once you have determined the desired mixture,							
45			Seed cost estimate per acre of mix:				$741.80		Click Here, to go to Job Sheet.						OR, click on PLSSpecifications TAB	
48				Enter												
49			Estimated Cost per plant	number			Plant		Flowering			Growth	Region in	Wetland		Site Moisture
50				of plants			Height		Period			Habit	State	Status	Additional Information on Plant	Needs
51	Woody Species especially beneficial to pollinators															
52	Buttonbush*	*Cephalanthus occidentalis*	15	20	300		30		sum			p	All	OBL	http://www.wildflower.org/plants,	moderate to high
53	Ninebark*	*Physocarpus opulifolius*	6	10	60		10	sprg				P	All	FAC	http://www.wildflower.org/plants,	low
54	Groundsel Tree*	*Baccharis halimifolia*	7	15	105		12		fall			P	All	FAC	http://www.wildflower.org/plants,	high
55																
56																
57																
58																
59																
60																
61																
62			Total Number per Acre (if used for pollinators, min. 4 per species and maximum 24 trees or shrubs/acre):				45									
63			Total Cost for Trees and Shrubs per Acre				$465.00									
64																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Thomas, Sudie - NRCS, Manning, SC
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Share Comments
Spelling Thesaurus Workbook Statistics Proofing
Check Accessibility Accessibility
Translate Language
New Comment Delete Previous Comment Next Comment Show Comments Comments
Notes Notes
Protect Sheet Protect Workbook Allow Edit Ranges Unshare Workbook Protect
Hide Ink Ink
C1
Native Species Planting Job Sheet
United States Department of Agriculture
NRCS Natural Resources Conservation Service
Native Species Planting Job Sheet
sudie.thomas:
Title can be changed if needed from "Pollinator" Planting to other type such as "Longleaf Restoration" or "Wildlife" Planting Job Sheet.
Natural Resources Conservation Service, South Carolina
Land User:
County:
Date:
Farm #:
Tract #:
Field(s):
Layout
Planned
Applied
Total Area Planted, acres (attach aerial if needed)
Seedbed Preparation Method (mechanical, herbicide,or both)
Seedbed Preparation Date
Planting Method (Hand, mechanical broadcast, no-till drill)
Planting Date
Establishment irrigation (yes, no)
Maintenance Mowing, date(s)
Livestock Exclusion (required)
Mixture and Planting Rate of Seeded Species (* = preferred by monarch butterflies)
Common Name
Scientific Name
Seeding Rate (lb/A)
% of Mix
Flowering Period
Growth Habit
Spiderwort, Ohio /Bluejacket
Tradescantia ohiensis
0.5
3%
sprg sum
P
Coreopsis-Lance Leaved* (NC ecotype)
Coreopsis lanceolata (NC)
0.5
9%
sprg sum
P
Susan, Black-Eyed* (NC ecotype)
Rudbeckia hirta (NC)
0.2
15%
sprg sum
P
Joe Pye Weed, Trumpetweed*
Eupatorium fistulosum (Eutrochium fistulosum)
0.2
14%
sum fall
P
Page 1
Fill in jobsheet/specification sheet, edit title as needed
Tips & Instructions
PLScalc
Bulkcalc
PLSSpecifications
BulkSpecifications
PlantList
SC Ecoregions Map
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Display Settings
100%

AutoSave Off — SC_Seed_Calculator_Planting_Jobsheet_2020JeffLdiff (version 1) - Auto

File Home Insert Page Layout Formulas Data Review View Help Acrobat Search

Normal | Page Break Preview | Page Layout | Custom Views | Ruler | Formula Bar | Gridlines | Headings | Zoom | 100% | Zoom to Selection | New Window | Arrange All | Freeze Panes | Split | Hide | Unhide | View Side by Side | Synchronous Scrolling | Reset Window Position

Workbook Views | Show | Zoom | Window

C1 | Monarch Habitat Planting Job Sheet

United States Department of Agriculture — NRCS Natural Resources Conservation Service

Monarch Habitat Planting Job Sheet

Natural Resources Conservation Service, South Carolina — Updated Jan. 2015

Land User:		**County:**	**Date:** 11/30/20
Farm #:	**Tract #:**	**Field(s):**	

Layout	Planned	Applied
Total Area Planted, acres (attach aerial if needed)		
Seedbed Preparation Method (mechanical, herbicide,or		
Seedbed Preparation Date		
Planting Method (Hand, mechanical broadcast, no-till		
Planting Date		
Establishment irrigation (yes, no)		
Maintenance Mowing, date(s)		
Livestock Exclusion (required)		

Mixture and Planting Rate of Seeded Species (* = preferred by monarch butterflies)

Common Name	Scientific Name	Seeding Rate (lb/A)	% of Mix	Flowering Period				Growth Habit
Spiderwort, Ohio /Bluejacket	*Tradescantia ohiensis*	0.5	3%	sprg	sum	0	0	P
Coreopsis-Lance Leaved* (NC ecotype)	*Coreopsis lanceolata (NC)*	0.5	9%	sprg	sum	0	0	P
Susan, Black-Eyed* (NC ecotype)	*Rudbeckia hirta (NC)*	0.2	15%	sprg	sum	0	0	P
Joe Pye Weed, Trumpetweed*	*Eupatorium fistulosum (Eutrochium fistulosum)*	0.2	14%	0	sum	fall	0	P
Wild Blue Lupine (legume)	*Lupinus perennis*	5	3%	sprg	0	0	0	P
Sunflower, Swamp/Narrow-Leaf (SC, FL, AL, MD	*Helianthus angustifolius (SC, FL, AL, MD)*	0.5	11%	0	sum	fall	0	P
Coneflower, Clasping	*Rudbeckia amplexicaulis*	0.2	14%	sprg	sum	0	0	P
Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	1.2	12%	sprg	sum	fall	0	A
Mint, Spotted Bee Balm* (SC, NC ecotypes)	*Monarda punctata (SC, NC)*	0.2	13%	0	sum	0	0	A
Milkweed, Butterfly *	*Asclepias tuberosa*	0.5	2%	0	sum	0	0	P
Bluestem, Little (grass) -NC ecotype	*Schizachyrium scoparium (Andropogon scoparius)*	0.5	6%	0	0	0	0	P
	Total lb seed/acre:	9.5		lb.:				$741.80
	Seed/sq foot	53.1						

Vine, Shrub, or Tree Transplants

Common Name	Scientific Name	No. per acre	Flowering Period	Growth Habit
0		0		
0		0		

Fill in jobsheet/specification sheet, edit title as needed

Adjust print area, hide or delete blank rows, print; or copy and paste into Word doc.

Client can provide to vendors as a starting point.

Tips & Instructions | PLScalc | Bulkcalc | PLSSpecifications | BulkSpecifications | PlantList | SC Ecoregions Map

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Mixture and Planting Rate of Seeded Species (* = preferred by monarch butterflies)

Common Name	Scientific Name	Seeding Rate (lb/A)	% of Mix	Flowering Period				Growth Habit
Spiderwort, Ohio /Bluejacket	*Tradescantia ohiensis*	0.5	3%	sprg	sum			P
Coreopsis-Lance Leaved* (NC ecotype)	*Coreopsis lanceolata (NC)*	0.5	9%	sprg	sum			P
Susan, Black-Eyed* (NC ecotype)	*Rudbeckia hirta (NC)*	0.2	15%	sprg	sum			P
Joe Pye Weed, Trumpetweed*	*Eupatorium fistulosum (Eutrochium fistulosum)*	0.2	14%		sum	fall		P
Wild Blue Lupine (legume)	*Lupinus perennis*	5	3%	sprg				P
Sunflower, Swamp/Narrow-Leaf (SC, FL, AL, MD ecotypes)	*Helianthus angustifolius (SC, FL, AL, MD)*	0.5	11%		sum	fall		P
Coneflower, Clasping	*Rudbeckia amplexicaulis*	0.2	14%	sprg	sum			P
Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	1.2	12%	sprg	sum	fall		A
Mint, Spotted Bee Balm* (SC, NC ecotypes)	*Monarda punctata (SC, NC)*	0.2	13%		sum			A
Milkweed, Butterfly *	*Asclepias tuberosa*	0.5	2%		sum			P
Bluestem, Little (grass) -NC ecotype	*Schizachyrium scoparium (Andropogon scoparius)*	0.5	6%					P
	Total lb seed/acre:	9.5			lb.:			$741.80
	Seed/sq foot	53.1						

Vine, Shrub, or Tree Transplants

Common Name	Scientific Name	No. per acre	Flowering Period	Growth Habit
Buttonbush*	*Cephalanthus occidentalis*	20	sum	P
Ninebark*	*Physocarpus opulifolius*	10	sprg	P
Groundsel Tree*	*Baccharis halimifolia*	15	fall	P
	Total number per acre:	45	Estimated Cost per Acre	$465.00
			Estimated Total Plant Material Cost/Acr	$1,206.80

Additional Notes, Specifications, Operations, and Maintenance Requirements, etc.

...re species, cultivars, varieties or selections of plant material used are appropriate for the project and ...ject site by gathering information on the seed source location, inteded hardiness zones, growth ...requirements, and the intended purpose. For plantings designed to attract pollinators, protect from potential harmful chemical drift. When planting seed, use a carrier with seed for better coverage and distribution. Kitty litter, pelletized lime, cracked corn, sawdust, soy hulls, or sand should be mixed with seeds before planting (use at least 3 times the amount of seed, more is best). Be sure weedy competition from undesirable plants (bahia, bermuda, fescue, johnsongrass, etc.) is controlled prior to planting. Seedbed should be firm, not fluffy or seeds will be planted too deep and will not germinate (plant seeds no deeper than 1/4 inch, okay for ~30% of seed to be visible on top of ground). Roll or cultipack after planting on firm seedbed.

Additional Notes: Evaluate the site within three months of initial seeding. If there is weedy competition during the 1st growing season, mow competition while planted seedlings put down roots. Mow with set blades high- 10-12 inches in early spring, then through the summer and fall. Successful establishment may not be evident until year 2 or 3.If the stand is uniform but too thin (<80% ground cover or transplant survival), re-evaluate in 6 months. If stand is still too thin, plant or apply additional seed or plants during the next optimum seeding/planting period. For seeded plantings with establishment rates of less than 50%, reseed the site in accordance with original planting plan. Expect the stand to vary in subsequent years. Differences in weather, maintenance practices, and variability in species planted will cause shifts in species composition.

Participant

Tips & Instructions | PLScalc | Bulkcalc | PLSSpec

United States Department of Agriculture

NRCS Natural Resources Conservation Service

Native Species Planting Job Sheet

Natural Resources Conservation Service, South Carolina			Updated Jan. 2015
Land User:		**County:**	**Date:** 6/17/20
Farm #:	**Tract #:**	**Field(s):**	

Layout	Planned	Applied
Total Area Planted, acres (attach aerial if needed)		
Seedbed Preparation Method (mechanical, herbicide, or both)		
Seedbed Preparation Date		
Planting Method (Hand, mechanical broadcast, no-till drill)		
Planting Date		
Establishment irrigation (yes, no)		
Maintenance Mowing, date(s)		
Livestock Exclusion (required)		

Mixture and Planting Rate of Seeded Species (* = preferred by monarch butterflies)

Common Name	Scientific Name	Seeding Rate (lb/A)	% of Mix	Flowering Period	Growth Habit
Spiderwort, Ohio /Bluejacket	*Tradescantia ohiensis*	0.4	3%	sprg sum	P
Coreopsis-Lance Leaved* (NC ecotype)	*Coreopsis lanceolata (NC)*	0.5	11%	sprg sum	P
Susan, Black-Eyed* (NC ecotype)	*Rudbeckia hirta (NC)*	0.15	14%	sprg sum	P
Joe Pye Weed, Trumpetweed*	*Eupatorium fistulosum (Eutrochium fistulosum)*	0.15	13%	sum fall	P
Wild Blue Lupine (legume)	*Lupinus perennis*	1	1%	sprg	P
Sunflower, Swamp/Narrow-Leaf (SC, FL, AL, MD ecotypes)	*Helianthus angustifolius (SC, FL, AL, MD)*	0.4	11%	sum fall	P
Coneflower, Clasping	*Rudbeckia amplexicaulis*	0.15	13%	sprg sum	P
Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	1	12%	sprg sum fall	A
Bluestem, Little (grass)	*Schizachyrium scoparium (Andropogon scoparius)*	0.3	4%		P
Mint, Spotted Bee Balm* (SC, NC ecotypes)	*Monarda punctata (SC, NC)*	0.2	16%	sum	A
Milkweed, Butterfly *	*Asclepias tuberosa*	0.3	1%	sum	P
	Total lb seed/acre:	4.6		Estimated Cost per ac.:	$383.75
	Seed/sq foot	41.9			

Additional Notes, Specifications, Operations, and Maintenance Requirements, etc.

Be sure species, cultivars, varieties or selections of plant material used are appropriate for the project and project site by gathering information on the seed source location, inteded hardiness zones, growth requirements, and the intended purpose. For plantings designed to attract pollinators, protect from potential harmful chemical drift. When planting seed, use a carrier with seed for better coverage and distribution. Kitty litter, pelletized lime, cracked corn, sawdust, soy hulls, or sand should be mixed with seeds before planting (use at least 3 times the amount of seed, more is best). Be sure weedy competition from undesirable plants (bahia, bermuda, fescue, johnsongrass, etc.) is controlled prior to planting. Seedbed should be firm, not fluffy or seeds will be planted too deep and will not germinate (plant seeds no deeper than 1/4 inch, okay for ~30% of seed to be visible on top of ground). Roll or cultipack after planting on firm seedbed.

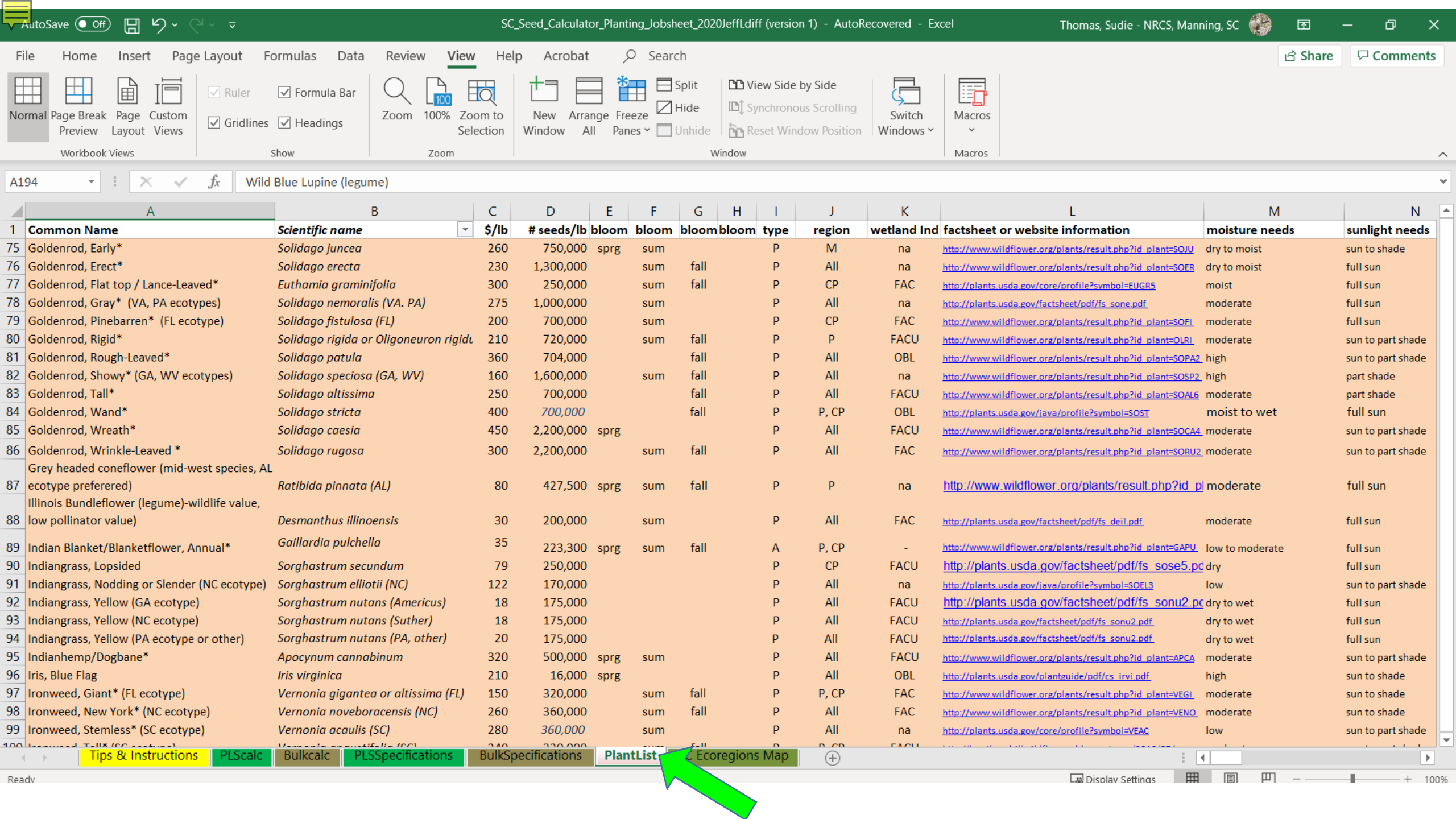
Additional Notes: Evaluate the site within three months of initial seeding. If there is weedy competition during the 1st growing season, mow competition while planted seedlings put down roots. Mow with set blades high- 10-12 inches in early spring, then through the summer and fall. Successful establishment may not be evident until year 2 or 3.If the stand is uniform but too thin (<80% ground cover or transplant survival), re-evaluate in 6 months. If stand is still too thin, plant or apply additional seed or plants during the next optimum seeding/planting period. For seeded plantings with establishment rates of less than 50%, reseed the site in accordance with original planting plan. Expect the stand to vary in subsequent years. Differences in weather, maintenance practices, and variability in species planted will cause shifts in species composition.

Participant

Signature_____Date_____

NRCS Representative

Signature_____Date_____



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A194 | Wild Blue Lupine (legume)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Common Name**	***Scientific name***	**$/lb**	**# seeds/lb**	**bloom**	**bloom**	**bloom**	**bloom**	**type**	**region**	**wetland Ind**	**factsheet or website information**	**moisture needs**	**sunlight needs**
75	Goldenrod, Early*	*Solidago juncea*	260	750,000	sprg	sum			P	M	na	http://www.wildflower.org/plants/result.php?id_plant=SOJU	dry to moist	sun to shade
76	Goldenrod, Erect*	*Solidago erecta*	230	1,300,000		sum	fall		P	All	na	http://www.wildflower.org/plants/result.php?id_plant=SOER	dry to moist	full sun
77	Goldenrod, Flat top / Lance-Leaved*	*Euthamia graminifolia*	300	250,000		sum	fall		P	CP	FAC	http://plants.usda.gov/core/profile?symbol=EUGR5	moist	full sun
78	Goldenrod, Gray* (VA, PA ecotypes)	*Solidago nemoralis (VA. PA)*	275	1,000,000		sum			P	All	na	http://plants.usda.gov/factsheet/pdf/fs_sone.pdf	moderate	full sun
79	Goldenrod, Pinebarren* (FL ecotype)	*Solidago fistulosa (FL)*	200	700,000		sum			P	CP	FAC	http://www.wildflower.org/plants/result.php?id_plant=SOFI	moderate	full sun
80	Goldenrod, Rigid*	*Solidago rigida or Oligoneuron rigidu*	210	720,000		sum	fall		P	P	FACU	http://www.wildflower.org/plants/result.php?id_plant=OLRI	moderate	sun to part shade
81	Goldenrod, Rough-Leaved*	*Solidago patula*	360	704,000			fall		P	All	OBL	http://www.wildflower.org/plants/result.php?id_plant=SOPA2	high	sun to part shade
82	Goldenrod, Showy* (GA, WV ecotypes)	*Solidago speciosa (GA, WV)*	160	1,600,000		sum	fall		P	All	na	http://www.wildflower.org/plants/result.php?id_plant=SOSP2	high	part shade
83	Goldenrod, Tall*	*Solidago altissima*	250	700,000			fall		P	All	FACU	http://www.wildflower.org/plants/result.php?id_plant=SOAL6	moderate	part shade
84	Goldenrod, Wand*	*Solidago stricta*	400	*700,000*			fall		P	P, CP	OBL	http://plants.usda.gov/java/profile?symbol=SOST	moist to wet	full sun
85	Goldenrod, Wreath*	*Solidago caesia*	450	2,200,000	sprg				P	All	FACU	http://www.wildflower.org/plants/result.php?id_plant=SOCA4	moderate	sun to part shade
86	Goldenrod, Wrinkle-Leaved *	*Solidago rugosa*	300	2,200,000		sum	fall		P	All	FAC	http://www.wildflower.org/plants/result.php?id_plant=SORU2	moderate	sun to part shade
87	Grey headed coneflower (mid-west species, AL ecotype preferered)	*Ratibida pinnata (AL)*	80	427,500	sprg	sum	fall		P	P	na	http://www.wildflower.org/plants/result.php?id_pl	moderate	full sun
88	Illinois Bundleflower (legume)-wildlife value, low pollinator value)	*Desmanthus illinoensis*	30	200,000		sum			P	All	FAC	http://plants.usda.gov/factsheet/pdf/fs_deil.pdf	moderate	full sun
89	Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	35	223,300	sprg	sum	fall		A	P, CP	-	http://www.wildflower.org/plants/result.php?id_plant=GAPU	low to moderate	full sun
90	Indiangrass, Lopsided	*Sorghastrum secundum*	79	250,000					P	CP	FACU	http://plants.usda.gov/factsheet/pdf/fs_sose5.pd	dry	full sun
91	Indiangrass, Nodding or Slender (NC ecotype)	*Sorghastrum elliotii (NC)*	122	170,000					P	All	na	http://plants.usda.gov/java/profile?symbol=SOEL3	low	sun to part shade
92	Indiangrass, Yellow (GA ecotype)	*Sorghastrum nutans (Americus)*	18	175,000					P	All	FACU	http://plants.usda.gov/factsheet/pdf/fs_sonu2.pd	dry to wet	full sun
93	Indiangrass, Yellow (NC ecotype)	*Sorghastrum nutans (Suther)*	18	175,000					P	All	FACU	http://plants.usda.gov/factsheet/pdf/fs_sonu2.pdf	dry to wet	full sun
94	Indiangrass, Yellow (PA ecotype or other)	*Sorghastrum nutans (PA, other)*	20	175,000					P	All	FACU	http://plants.usda.gov/factsheet/pdf/fs_sonu2.pdf	dry to wet	full sun
95	Indianhemp/Dogbane*	*Apocynum cannabinum*	320	500,000	sprg	sum			P	All	FACU	http://www.wildflower.org/plants/result.php?id_plant=APCA	moderate	sun to part shade
96	Iris, Blue Flag	*Iris virginica*	210	16,000	sprg				P	All	OBL	http://plants.usda.gov/plantguide/pdf/cs_irvi.pdf	high	sun to shade
97	Ironweed, Giant* (FL ecotype)	*Vernonia gigantea or altissima (FL)*	150	320,000		sum	fall		P	P, CP	FAC	http://www.wildflower.org/plants/result.php?id_plant=VEGI	moderate	sun to shade
98	Ironweed, New York* (NC ecotype)	*Vernonia noveboracensis (NC)*	260	360,000		sum	fall		P	All	FAC	http://www.wildflower.org/plants/result.php?id_plant=VENO	moderate	sun to shade
99	Ironweed, Stemless* (SC ecotype)	*Vernonia acaulis (SC)*	280	*360,000*		sum			P	All	na	http://plants.usda.gov/core/profile?symbol=VEAC	low	sun to part shade

Tips & Instructions | PLScalc | Bulkcalc | PLSSpecifications | BulkSpecifications | PlantList | Ecoregions Map

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A1 | This map depicts SC Ecoregions. Use this to as a guidance for appropriate planting areas for plant species listed. For the purposes of the plant list, the Middle A

This map depicts SC Ecoregions. Use this to as a guidance for appropriate planting areas for plant species listed. For the purposes of the plant list, the Middle Atlantic Coastal Plain, and the Southeastern Coastal Plains have been lumped together and called the Coastal Plain (CP)

Ecoregions of South Carolina

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions are directly applicable to many state agency activities, including the selection of regional stream reference sites, the development of biological criteria and water quality standards, and the establishment of management goals for nonpoint-source pollution. They are also relevant to integrated ecosystem management, an ultimate goal of many federal and state resource management agencies.

The approach used to compile this map of South Carolina is based on the premise that ecological regions can be identified through the analysis of the patterns of biotic and abiotic phenomena that reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I and Level II divide the North American continent into 15 and 52 regions, respectively (Commission for Environmental Cooperation Working Group 1997). At Level III, the continental United States contains 104 regions (United States Environmental Protection Agency [U.S. EPA] 2000). Level IV is a further subdivision of the Level III ecoregions. Explanations of the methods used to define the U.S. EPA's ecoregions are given in Omernik (1995), Griffith and others (1997, 2002a), and Gallant and others (1989).

The Level III and IV Ecoregions of South Carolina map was compiled at a scale of 1:250,000; it depicts revisions and subdivisions of earlier Level III ecoregions that were originally compiled at a smaller scale (U.S. EPA 1999; Omernik 1987). Compilation of this map is part of a collaborative project primarily between the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), the U.S. EPA National Health and Environmental Effects Research Laboratory (NHEERL), U.S. EPA Region IV, and the South Carolina Department of Health and Environmental Control (DHEC). This project is also associated with an interagency effort to develop a common framework of ecological regions (McMahon and others 2001; Griffith and others 2002b). Regional collaborative projects, such as this one in South Carolina where some agreement can be reached among multiple resource management agencies, are a step in the direction of attaining commonality and consistency in ecoregion frameworks for the entire nation.

Comments regarding this Level III [illegible] of South Carolina map should be [illegible] USDA-NRCS, 200 SW 35th Street, [illegible] (541) 754-4465, email:

Tips & Instructions | PLScalc | Bulkcalc | PLSSpecifications | BulkSpecifications | PlantList | SC Ecoregions Map

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Xerces Seed Calculator Example (NC Pollinator Mix)

Seed vendors will develop lists per your specs using their own seed calculators

NOTE: This is a working spreadsheet that Nancy.Adamson@xerces.org developed for a pollinator planting in

NOTES

Add oats after reach 100%

Grasses 25% or less by wt.

Recommend plugs

Recommend plugs (could sub Baptisia,

Recommend plugs

Recommend plugs

Recommend plugs

Xerces Society Pollinator Program Seed Rate Calculator

Bloom	Common name	Species/Variety	Percent of mix (%)	Total number seed/ft2	Target seed/ft^2	Ft2 / ac	Number seeds/lb #	Baseline seeding rate lbs seed/ac	Number acres acres	Total pounds lbs seed	Price/lb PLS ($5 min/sp.)	Price per species	Vendor1 Price lb PLS $5 min/sp.	V1 Availability
gc	spring oats (nurse crop)	*Avena sativa* (not native)	5.00%	40	2.00	43560	**16,200**	5.38	0.500	2.689	$0.75	$2.02	$0.75	High
gc	bottlebrush grass	*Elymus hystrix*	0.00%	40	0.00	43560	**121,600**	0.00	0.500	0.000	$180.00	$0.00	$180.00	High
gc	wild rye (grass)	*Elymus virginicus*	2.00%	40	0.80	43560	**100,000**	0.35	0.500	0.174	$15.00	$2.61	$15.00	High
gw	splitbeard bluestem (grass)	*Andropogon ternarius*	1.00%	40	0.40	43560	**216,000**	0.08	0.500	0.040	$100.00	$4.03	$100.00	?
gw	beaked panicum (grass)	*Panicum anceps*	2.00%	40	0.80	43560	**250,000**	0.14	0.500	0.070	$22.00	$1.53	$22.00	High
gw	little bluestem (grass)	*Schizachyrium scoparium*	6.00%	40	2.40	43560	**240,000**	0.44	0.500	0.218	$16.00	$3.48	$16.00	Low
gw	indian grass (grass)	*Sorghastrum nutans*	2.00%	40	0.80	43560	**175,000**	0.20	0.500	0.100	$11.00	$1.10	$11.00	Low
gw	purpletop (grass)	*Tridens flavus*	1.00%	40	0.40	43560	**465,000**	0.04	0.500	0.019	$21.00	$0.39	$21.00	Low
sp	white wild indigo (legume)	*Baptisia alba*	0.00%	40	0.00	43560	**25,000**	0.00	0.500	0.000	$437.50	$0.00	$437.50	Low
sp	lupine	*Lupinus perennis*	2.00%	40	0.80	43560	**23,000**	1.52	0.500	0.758	$12.50	$9.47	$620.00	Low
sp	Appalachian beardtongue	*Penstemon laevigatus*	2.00%	40	0.80	43560	**350,000**	0.10	0.500	0.050	$620.00	$30.87	$620.00	Low
sp	goat's rue	*Tephrosia virginiana*	0.00%	40	0.00	43560	**32,000**	0.00	0.500	0.000	$500.00	$0.00	$500.00	Low
sp	golden alexanders	*Zizia aurea*	1.00%	40	0.40	43560	**192,000**	0.09	0.500	0.045	$400.00	$18.15	$400.00	Low
sp,su	purple coneflower	*Echinacea purpurea*	2.00%	40	0.80	43560	**115,000**	0.30	0.500	0.152	$45.00	$6.82	$45.00	High
sp,su	Indian blanket	*Gaillardia pulchella*	4.00%	40	1.60	43560	**223,300**	0.31	0.500	0.156	$45.00	$7.02	$45.00	Low
sp,su	Ohio spiderwort	*Tradescantia ohiensis*	0.00%	40	0.00	43560	**145,000**	0.00	0.500	0.000	$575.00	$0.00	$575.00	Low
su	swamp milkweed	*Asclepias incarnata*	0.00%	40	0.00	43560	**70,000**	0.00	0.500	0.000	$495.00	$0.00	$495.00	Medium
su	butterfly milkweed	*Asclepias tuberosa*	0.00%	40	0.00	43560	**56,000**	0.00	0.500	0.000	$300.00	$0.00	$300.00	Medium
su	NJ tea	*Ceanothus americanus*	0.00%	40	0.00	43560	**112,000**	0.00	0.500	0.000	$625.00	$0.00	$625.00	Low

This example and others are posted at https://tinyurl.com/SEMonarchs2020. State NRCS (FL, NC, SC, TN, WV) calculators also c/o NRCS Field Office Technical Guide(FOTG) https://efotg.sc.egov.usda.gov/.

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Seed Calculator Example (NC Pollinator Mix)

Seed vendors will develop lists per your specs using their own seed calculators

Percent of mix (%)	Total number seed/ft2	Target seed/ft^2	Ft2 / ac	Number seeds/lb #	Baseline seeding rate lbs seed/ac	Number acres acres	Total pounds lbs seed	Price/lb PLS ($5 min/sp.)	Price per species
1.00%	40	0.40	43560	**135,000**	0.13	0.500	0.065	$128.75	$8.31
1.00%	40	0.40	43560	**1,000,000**	0.02	0.500	0.009	$1,087.50	$9.47
3.00%	40	1.20	43560	**750,000**	0.07	0.500	0.035	$300.00	$10.45
2.00%	40	0.80	43560	**1,014,000**	0.03	0.500	0.017	$587.50	$10.10
1.00%	40	0.40	43560	**144,000**	0.12	0.500	0.061	$150.00	$9.08
1.00%	40	0.40	43560	**360,000**	0.05	0.500	0.024	$537.50	$13.01
105.00% *	**40**	**40.00**	**43560**		**12.31**	**0.500**	**6.15**	**Total price:**	**$229.63**
				% by weight grasses (must be <25%)			7.2487691	per acre	$459.26
				#spr	5				
				#su	7				
				#f	11				

*The 105% here comes from added 5% oats (non-native nurse crop) after reaching 100% of native mix

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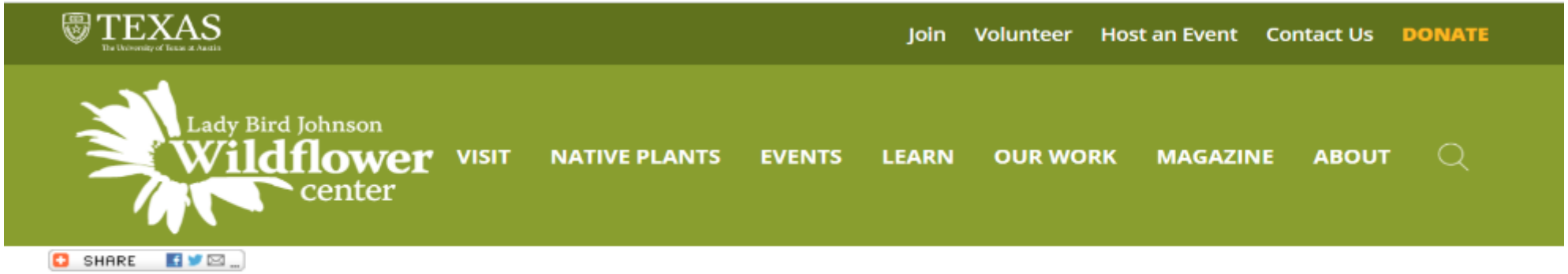
Native Plant & Seed Suppliers c/o Lady Bird Johnson Wildflower Center



NATIONAL SUPPLIERS DIRECTORY

This directory has been compiled to make it easier to find businesses that sell native plants or seeds and provide professional landscape or consulting services. Use the search options below to find help for your native plant needs or click here to add your business to the directory. *Associates are providers of native plant services who offer Wildflower Center members a discount on merchandise or services. To qualify, at least 50% of an Associate's projects or inventory must use native plants.*

Search suppliers:

Name Search | Enter Search Location (City, State or Zip)

Search | Search

https://www.wildflower.org/suppliers/ -- Note vendors are self-selected so includes some who also sell non-natives

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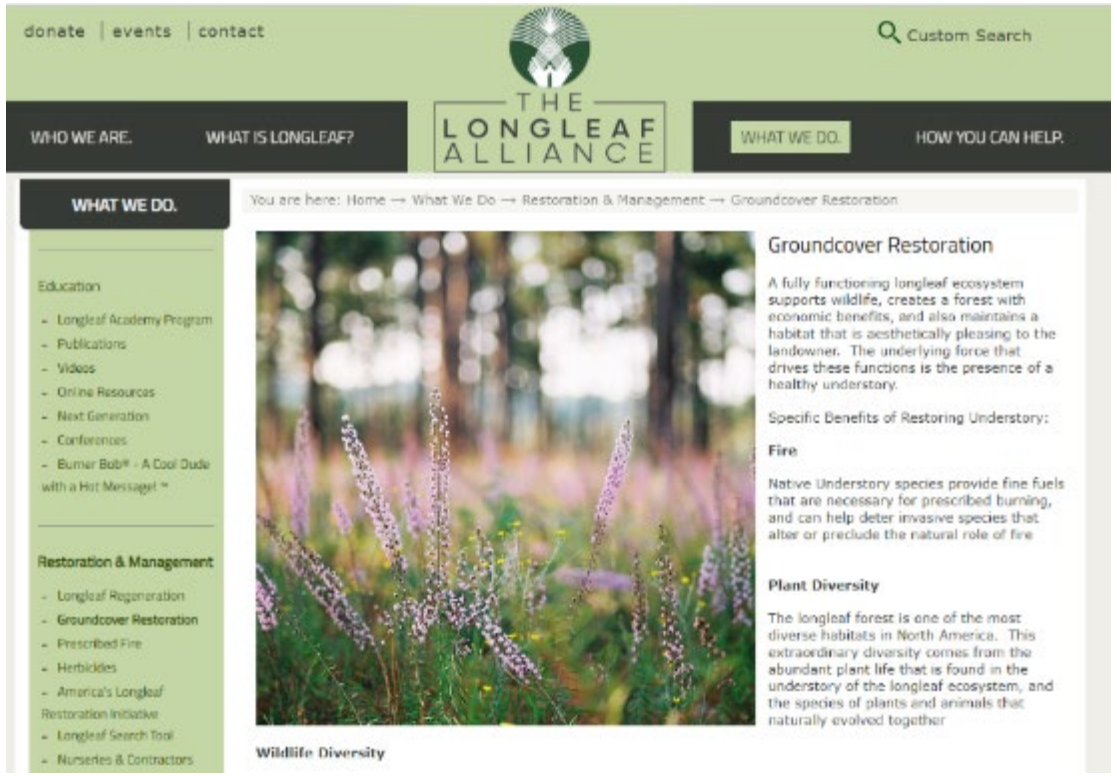
Hand-collected seeds or meadows harvested (like hay) can supplement plantings



https://www.longleafalliance.org/what-we-do/restoration-management/groundcover-restoration

Farm Bill supported plantings require seed be purchased as Pure Live Seed (PLS).

Organization like the Longleaf Alliance support other habitat restoration work that benefits monarchs using hand collected or mechanically harvested (but untested) seed.

If hand collecting, focus on common species, only harvest small amounts. Work with local native plant societies to learn about harvesting and propagation of common natives not yet commercially available.


Carphephorus vanillaleaf and chaffhead


Asclepias lanceolata fewflower milkweed

There is higher demand for than availability of local ecotype seeds, so there may be opportunities to sell seed to native seed vendors.

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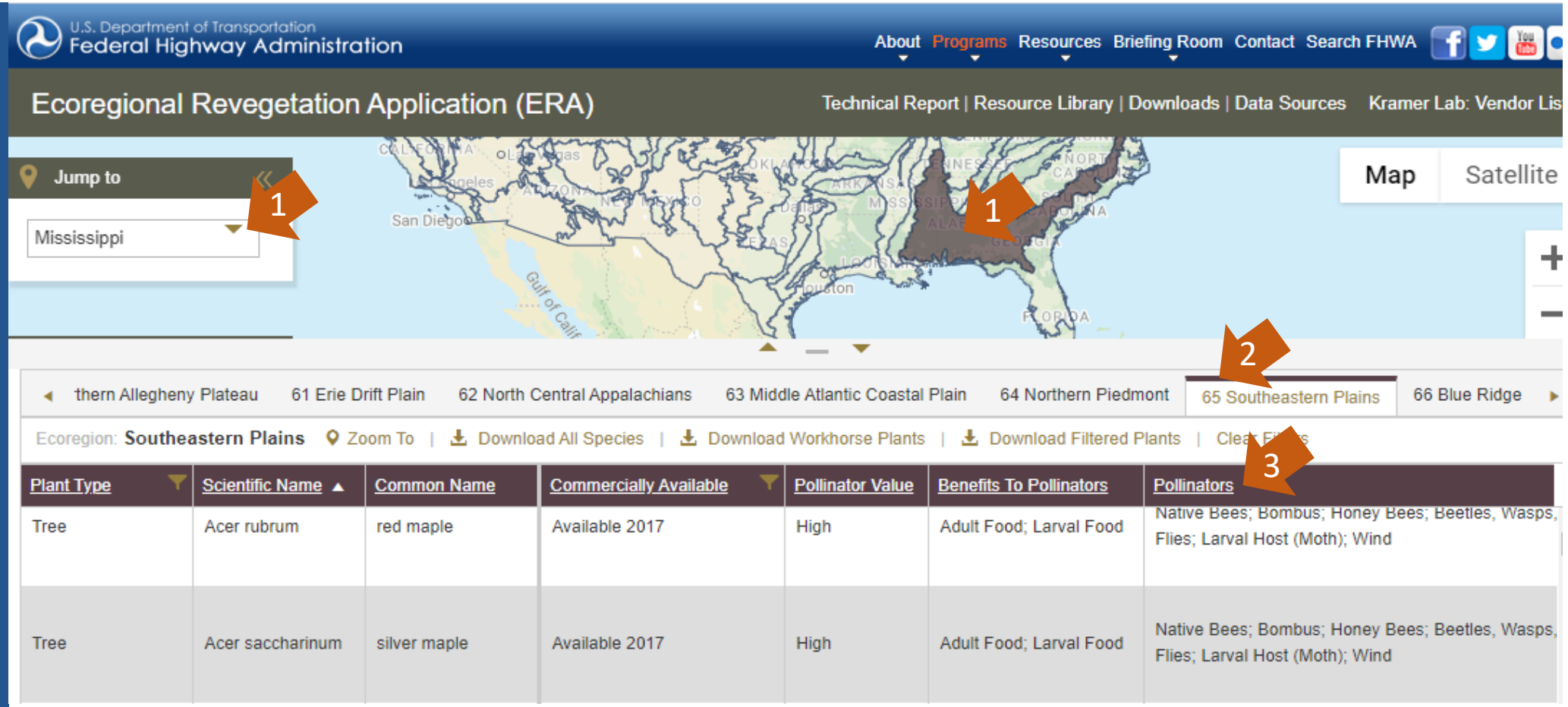
NEW FHA Ecoregional Revegetation Application (ERA)

plant database with pollinator information provided by Xerces*

1. Choose location (by state, by ecoregion)
2. Scroll to ecoregion identified
3. Scroll to pollinator information
4. Can filter by plant type
5. Can download



Plant Type	Scientific Name	Common Name	Commercially Available	Pollinator Value	Benefits To Pollinators	Pollinators
Tree	Acer rubrum	red maple	Available 2017	High	Adult Food; Larval Food	Native Bees; Bombus; Honey Bees; Beetles, Wasps, Flies; Larval Host (Moth); Wind
Tree	Acer saccharinum	silver maple	Available 2017	High	Adult Food; Larval Food	Native Bees; Bombus; Honey Bees; Beetles, Wasps, Flies; Larval Host (Moth); Wind

http://www.nativerevegetation.org/era

*Jennifer Hopwood greatly expanded dataset Xerces developed for the Lady Bird Johnson Wildflower Center's special plant collections for pollinators https://www.wildflower.org/collections/

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Remember the work you do creating and connecting monarch habitat grows ever more important, especially with changes in climate

Monarchs and other Lepidoptera travel through landscapes from one habitat to another, while many other species are “central place” foragers, traveling from their nest sites in search of food. Connectivity is vital for all as climate change affects them and their habitats.

Heat wave intensity increases greatest in the southeastern US: https://www.globalchange.gov/

Photo: Nancy Lee Adamson

Malcolm, S. B. 2018. Anthropogenic impacts on mortality and population viability of the monarch butterfly. *Annual Review of Entomology* 63:277-302.

Moreno-Sanchez, R., Raines, J., Diffendorfer, J., Drummond, M. A., & Manko, J. 2019. Challenges for Monitoring the Extent and Land Use/Cover Changes in Monarch Butterflies’ Migratory Habitat across the United States and Mexico. *Land* 8(10):156.

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Thank you!! Xerces Society support also provided by:

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XERCES SOCIETY
for Invertebrate Conservation

We are a donor-supported nonprofit organization.

Monarch butterfly on frostweed, *Verbesina virginica*
Photo: Anthony Burns

Thank you!

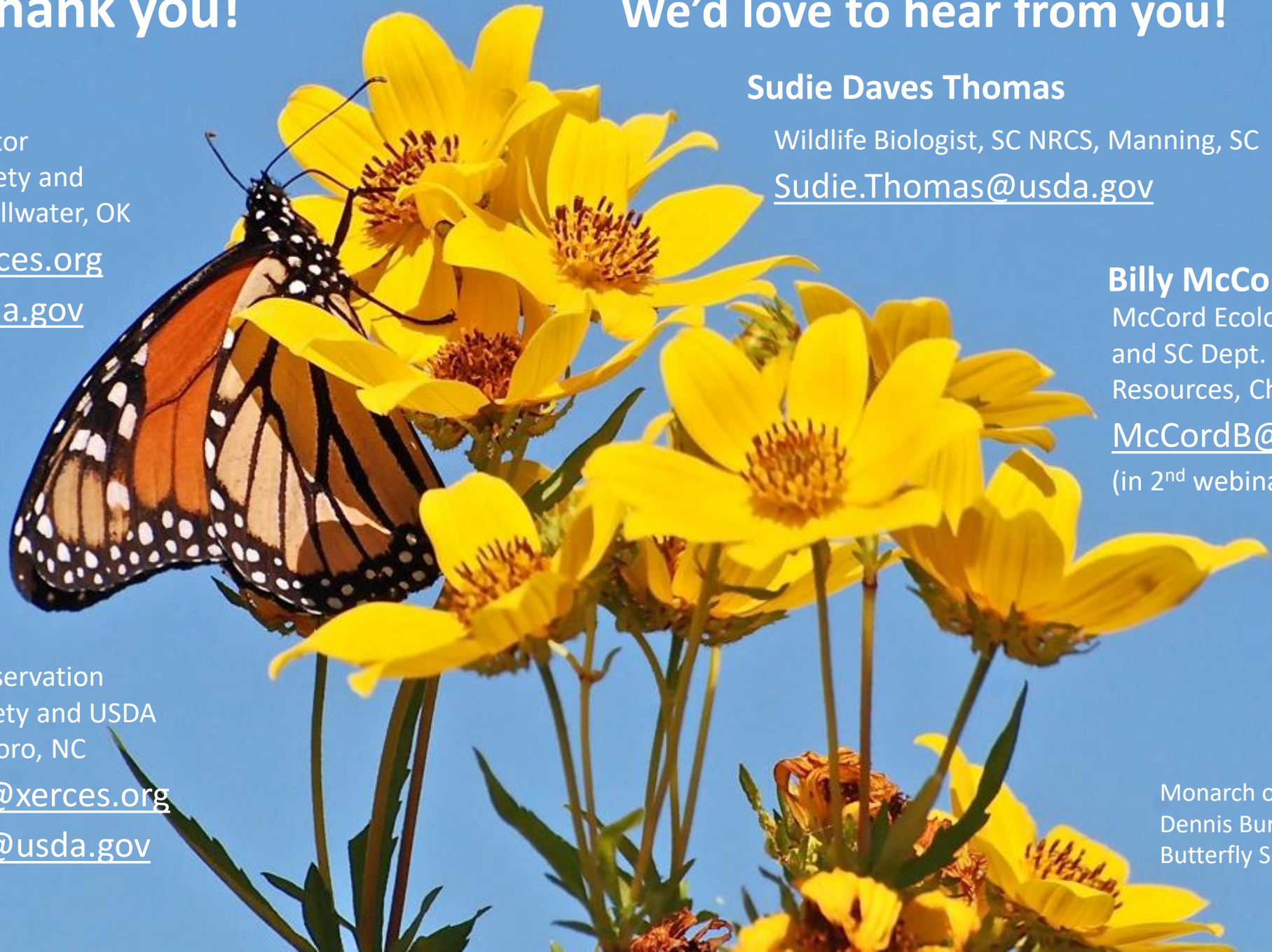
Ray Moranz
Grazing Lands Pollinator Ecologist, Xerces Society and USDA NRCS CNTSC Stillwater, OK
Ray.Moranz@xerces.org
Ray.Moranz@usda.gov

Nancy Adamson
Senior Pollinator Conservation Specialist Xerces Society and USDA NRCS ENTSC Greensboro, NC
Nancy.Adamson@xerces.org
Nancy.Adamson@usda.gov

We'd love to hear from you!

Sudie Daves Thomas
Wildlife Biologist, SC NRCS, Manning, SC
Sudie.Thomas@usda.gov

Billy McCord
McCord Ecological Services and SC Dept. of Natural Resources, Charleston, SC
McCordB@dnr.sc.gov
(in 2nd webinar)



Monarch on tickseed by Dennis Burnette, Carolina Butterfly Society

Research Needs

1. What are the effects of stocking rate on abundance and diversity of milkweeds and nectar plants, as well as on flower production and monarch abundance?
2. With rotational grazing, how long should a paddock be rested before returning livestock so as to ensure flower production somewhere on the ranch each year?
3. How do livestock species differ in their impacts on monarch habitat?

Is Milkweed Compatible with Grazing?

Milkweed may need to be protected from livestock, as much as rangeland managers may want to protect livestock from milkweed.

20. *A. pedicellata*	26	—	—	—	1	Southeast	25	16
21. *A. cryptoceras*	25	—	—	—	1	West	36	2, 4
22. *A. solanoana*	24	—	—	—	1	West	3	2, 4
23. *A. fascicularis*	17	10	59	2–59	105	West	65	9
24. *A. incarnata*	14	—	—	0–28	2	East	715	2, 4
25. *A. tomentosa*	7	—	—	6–8	2	Southeast	13	16
26. *A. amplexicaulis*	~6	?	?	1–22	?	East	265	2, 4, 12, 16
27. *A. curtisii*	5	—	—	—	1	Southeast	10	16
28. *A. feayi*	2	—	—	—	1	Southeast	11	16
29. *A. tuberosa*	~3	—	—	0–6	5	East	924	2, 4
30. *A. verticillata*	1	—	—	0–1	2	East	526	2, 16
31. *A. viridiflora*	0 (51 in seeds)	—	—	—	1	Central	378	2, 4
African								
32. *A. fruticosa*	816	322	40	323–1,500	24	southern	global	14
33. *A. physocarpa*	331	—	—	—	1	southern	global	2, 14

271

[a]Species distributions are given as approximate geographical ranges in North America and an index of abundance based on the number of county records for each species mapped by Woodson (1954). Higher numbers reflect the wide distributions of common species, and low numbers indicate rarity.

[b]References: (1) Tahsler (1975); (2) Roeske *et al.* (1976); (3) Brower *et al.* (1982); (4) Seiber *et al.* (1983); (5) Brower *et al.* (1984b); (6) Brower *et al.* (1984a); (7) Lynch & Martin (1987); (8) Martin & Lynch (1988); (9) Malcolm & Brower (1989); (10) Malcolm *et al.* (1989); (11) Malcolm (1990); (12) Malcolm (1991); (13) Malcolm *et al.* (1991); (14) Nelson (1991a, b); (15) Lynch, Martin, Brower, & Malcolm (in prep.); (16) Malcolm, Cockrell, & Brower data.

[c]Neotropical annual spread into the southern and western United States; also cultivated, hence distribution unknown but locally very abundant.

[d]1985 sample from north central Florida.

[e]1983/84 sample from north central Florida.

[f]Florida sample.

[g]Louisiana sample.

Source: Malcom 1991

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