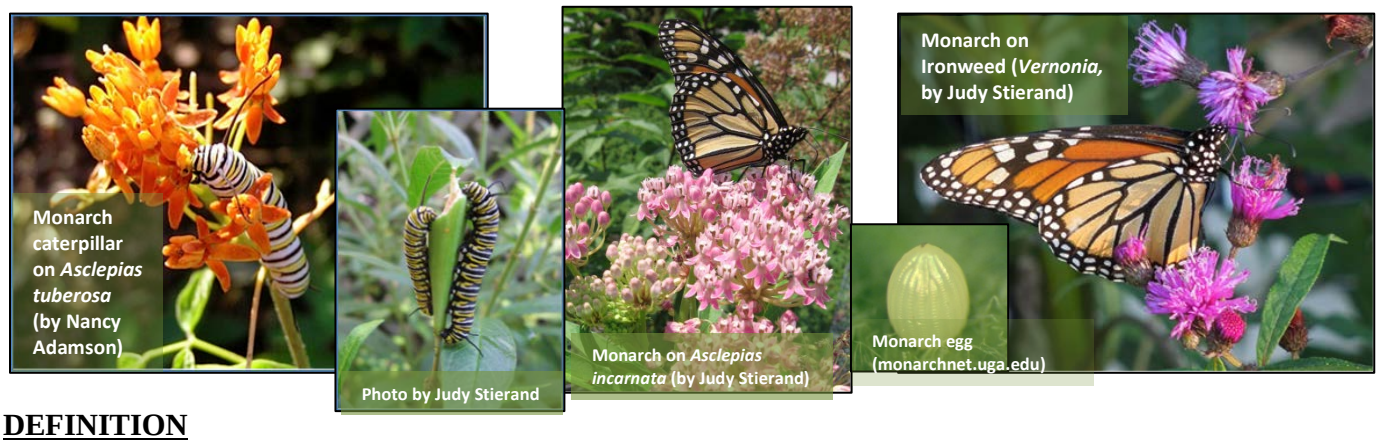
Conservation Cover (Monarch Habitat)

S. C. Practice Job Sheet 327

Prepared for: _____

Prepared by: _____

Farm: Tract: Date:



DEFINITION

Monarchs cannot survive without habitat that supports milkweed. Their caterpillars (larval stage of monarch life cycle) only eat milkweed (*Asclepias* species), therefore monarch butterflies need milkweed to lay their eggs. With shifting land management practices, much milkweed has been lost from the landscape and monarch populations have drastically declined. Stands of other native wildflowers and grasses provide nectar, pollen, and structure (for cover and to pupate/metamorphose and native bunch grasses will assist herbaceous wildflowers in staying upright). Native woody plants (trees, shrubs, vines) are also important nectar sources for monarchs, especially during spring when they migrate north.

PURPOSE

- Provide nectar and pollen for Monarch butterflies throughout the growing season
- Provide host sites (Milkweed) for Monarch larvae
- Provide cover (protection from weather and predators) and structure (pupation locations)

WHERE USED

- Odd or converted areas within farmland margins, field borders, old fields with low plant diversity, logging decks, or areas where exotic plants have been removed (including pasture grasses).
- Locations with at least six hours of sunlight.
- Areas where exotic invasive plant infestations will be removed or have previously been removed.
- Where habitat can be protected from pesticides (they can harm caterpillars and adults).

OPERATIONS

Pre-planting: Scout the areas at least one year prior to the planned seeding date. Identify all of the vegetation that will compete with desired planted native species. It is critical to the success of the seeding that the competition from other plants (especially bahia, bermuda, fescue, sericea, Johnson grass, Texas Panicum, and crabgrass) be removed prior to seeding. If areas of beneficial natives exist, protect those areas and establish new plants nearby.

Control competition: If chemical treatment is needed for problematic exotic and/or invasive plants, follow the recommendation of the Clemson Weed Guide or Clemson Extension for the correct herbicide treatment (guidance can also be found in the publication: A Management Guide for Invasive Plants in Southern Forests by Miller, James H.; Manning, Steven T.; Enloe, and Stephen F: http://www.srs.fs.usda.gov/pubs/36915). It can often be necessary to apply a chemical treatment in the fall before seeding in the spring, and/or to apply multiple treatments in the spring and summer before seeding in the fall or the following spring. Delay seeding for the recommended time necessary for selected herbicide (some herbicides persist).

HABITAT ESTABLISHMENT:

Seed Bed Preparation:

- Good seed to soil contact is extremely important.
- Prior to seeding, as much vegetation should be removed as possible by grazing, cutting and raking, or burning. For erodible sites, vegetation removal may need to be delayed until just prior to seeding or a cover crop can be utilized to hold the soil and then be killed just prior to seeding. Since this is a perennial planting, avoid cultivating close to seeding time so that weed seeds are not brought to the surface.
- Sites conventionally tilled: To prevent seed from becoming buried too deep, conventionally tilled sites need to be smoothed by disking and dragging. After smoothing, the site should be conditioned by using a culti-packer, roller, or other equipment to compact the soil surface.
- Crop field sites: To prevent bringing up weed seed, avoid tillage. Heavy crop residue may need to be burned, mowing and raked, or incorporated into the soil to ensure good seed to soil contact. However, tillage may be needed to smooth out crop ridges. If convention tillage is required, the soil should be culti-packed or rolled prior to seeding.

Monarch on *Asclepias tuberosa* (by Billy McCord)

Planting Seed:

- Broadcast seeding is recommended for small plots and diverse seed mixtures (small seeds may not move well through seed drills).
- Fertilizer or other soil amendments are not recommended.
- Never plant seeds deeper than ¼ inch (if soil is too fluffy, seed can be buried too deeply and will not germinate). A firm seed bed is essential.
- Very light rates of annuals such can be planted with target plant materials to stabilize the soil, reduce weed growth, and to give an early indication of establishment success if desired. Nurse crop species such as oats, annual rye grain, buckwheat (<20 lbs/ac), and browntop millet (<8 lbs/ac) can be added to the mix. Never use winter wheat, winter rye, perennial rye, or introduced clovers since some of these have properties that can suppress germination of planted seeds or can out-compete planted seedlings.
- If using a native seed drill, mix seed with a carrier such as pelletized lime, cat litter (clay bentonite), and/or annual nurse crop seed so that small seed are spread evenly.

Monarch on *Asclepias incarnata* (by Horst Stierand)

Broadcast seeding.

- Conventionally tilled sites can be mechanically (broadcast spreader) or manually (push seeder, hand crank seeder, or by hand) broadcast-seeded, however, it is critical that the site surface be culti-packed or rolled prior to seeding (for firm, not fluffy seed bed) and then again after seeding to press the seed into the soil.
- Mix seed with a carrier such as pelletized lime, cat litter (clay bentonite), sawdust, sand, rice hulls, soy hulls, or cracked corn in order to facilitate good seed coverage. Use at least 3 times as much carrier as seed. The more the seed is diluted, the better it will be distributed.
- Divide the seed/carrier mixture in half. Broadcast half the mixture in one direction over the area, then broadcast the other half at a right angle to the first pass to insure equal coverage.
- Roll the site with a roller, or drive across it with a truck or tractor tires to firm the seed into the soil (if soil is wet, wait until it dries to roll).

Monarch on Blazing Star (*Liatris sp.*, by Dale Buchner)

Monarch on *Asclepias tuberosa* (by Judy Stierand)

Monarch on aster (*Symphyotrichum* sp., by Dale Buchner)

REQUIREMENTS for application of Conservation Cover (327) Practice, Monarch Habitat:

Species Selection: Seeds or plants may be established. Many seed vendors and nurseries have highly diverse inventories and can create/provide mixtures tailored to the project needs. Lists of species and vendors should be provided to client.

Milkweed species: At least 20% of plant materials used must be native Milkweeds (*Asclepias spp*.); seeds or plants. Use local ecotype plant materials (originally obtained locally or from the southeast) if available.

- ***If using plugs or plants, only use those grown without the use of systemic insecticides*** (Because some insecticides persist in the plant tissues for months after the initial application in the greenhouse; caterpillars eating these plant materials may be harmed). *It is important to determine if plants have been treated before purchasing and planting them to benefit monarchs (ask the vendor to be sure).*
- ***Do not use non-native milkweeds***, such as Tropical (or Mexican) Milkweed, also known as Bloodflower (*Asclepias curassavica*), native to South America. Tropical Milkweed can persist into winter causing some monarchs to breed early instead of migrating south, creating non-migratory groups. One cold-snap can wipe out these groups, taking them out of the gene-pool and creating a population sink. The other part of the problem with Tropical Milkweed is that the confused non-migratory groups are more susceptible to parasites, which can be passed to the migratory populations, which can also have harmful effects on the entire Monarch population.

Native wildflowers: Monarchs and other pollinators will benefit from a diverse mixture of wildflowers. Use locally native species, from southeastern ecotypes. Provide a species mixture that will cover the growing season (at least 3 blooming in Spring, 3 blooming in Summer, 3 blooming in Fall). Species preferred by monarchs can are indicated in the SC NRCS Seed Calculator and are listed in a separate document. Examples of seed mixes are provided below.

Grasses: Native/local ecotype grasses should be included for needed structure. No more than 20% of the plot should be planted in grasses (seeds or plants); one or more species.

How many species to plant: ***At least 10 species total, but even more is better.*** At least 1 species of milkweed (20% of mix), at least 9 species of wildflowers (including milkweed and/or flowering woody trees/shrubs), and at least 1 species of grass (no more than 20% of mix).

Planting Rate:

- **Seed (milkweeds/wildflowers/grass):** The required seed planting rate for Monarch habitat establishment is **40–60 PLS** (**P**ure **L**ive **S**eed) per square foot (upper end of range if broadcasting). The only way to ensure PLS is to purchase seed that has been tested by a registered seed laboratory. **Most native seed vendors sell on a PLS basis (ask for PLS).**
- **Herbaceous wildflower plants:** Live plants (e.g. plugs, sprigs, tublings, bareroot, or containerized material) can be used alone or with seeds. Use spacing of 18"- 24"for plugs or up to 36"- 48'" for larger plants/pots. Cluster or plant in rows. If clumping, plant seedlings in groups of 10 to 20, 2-5 feet apart. Clumps can be situated about 25 feet apart with a goal of to 1,000 to 2,000 small plugs or 500 to 1,000 larger potted plants per acre. This type of planting may require irrigation.
- **Flowering woody trees, shrubs, and vines** can be included as nectar sources and to provide structure. These can be included as part of the 9 flowering species. Plant trees about 12 to 20 feet apart (depending on size at maturity), shrubs 6 to 12 feet apart in rows or clumps near herbaceous plantings. Tree shelters/ browse protection will aid in establishment.
- If necessary (for sloped areas > 6% with high erosion potential), mulch newly seeded area with 1,000 lbs. per acre of mulch material. Straw mulch shall consist of wheat, barley, oat or rye grain straw, hay, or grass cut from native grasses. Mulch must not contain noxious or invasive weeds.
- Ask NRCS Biologist for assistance with planting plan if needed.

When to Plant: Fall or dormant season is recommended for forbs/wildflowers since seed germinates better after exposure to a period of cold temperature and moisture (stratification). 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).

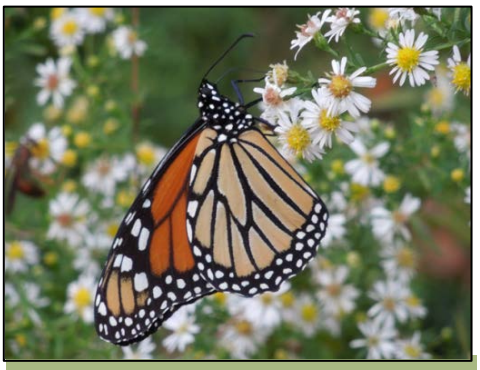
MAINTENANCE:

Planted stands should not be disturbed by the turning of machinery or driving within the stand. However, maintenance will be required in order to facilitate establishment and maintain desired species and structure. Monitoring and controlling weeds is very critical in the first and second years.

- During the 1st and 2nd years of establishment, competing exotic plants such as crabgrass, bahia, bermuda, Johnson grass and even some natives like dog fennel and horseweed will compete. If this occurs, mow only the areas with competing vegetation. When plants grow over 12", mow them down to 8" in order to allow more sunlight for desired perennials and to sever weed seed heads before they mature. Mow several times as needed over the growing season if competition continues to be a problem.
- Preferably, mowing should be limited to times when plants have died back or are dormant. Mowing at any time (even in the winter) kills insects. In the summer, some insects can't get away from the mower, especially eggs and caterpillars. In the winter insects may be dormant in leaf litter or plant stems. Mowing in patches ensures that pollinators can recolonize the mowed areas.
- Avoid insecticides. Pesticide and herbicide use on or near a habitat plot can have significant negative effects on pollinator populations. Install monarch habitat where chemical drift will not be an issue. Alternative means of addressing pest issues (mowing, haying, burning, etc.) should be used.
- If needed, minimal, well-timed herbicide applications can be applied. If chemicals must be used, choose the least toxic alternative, and apply them early and late in the day (but not at night), when fewer monarchs/pollinators are present. Please note that chemicals, especially insecticides, can kill monarch larvae, if they are present. Herbicides, if required, should be applied with targeted spot treatments instead of a broadcast method. Whenever possible, mechanical removal of shrubs should be used in combination with herbicides to maintain butterfly habitat.
- Control exotic invasive plant species by targeted or mechanical means.
- Consider adding a sign marking the Monarch habitat plots be sure farm workers or land managers do not accidentally mow, plow, or treat the plots with pesticides.
- Established stands can be maintained by burning in alternating patches. It is important to note that some monarch eggs or larvae may be killed during prescribed burns or other management actions. Therefore, no more than 1/3 - 1/2 of the stand should be mown, hayed, or burned at a time. Growing season fire will maximize improvements to biodiversity and woody plant control. Rotate maintenance activities throughout managed areas to maximize spatial and temporal diversity.

Monarch on New England Aster (by Judy Stierand)

Monarch on Joe Pye Weed (by Judy Stierand)



Monarch on aster (*Symphyotrichum* sp., by Judy Stierand)

Minimum requirements for Monarch habitat establishment (for Conservation Cover 327 Practice)		
Species	**Planting Rate (seeds)**	**Size**
Minimum 10 species: 1 or more milkweed (> 20% of mix), 9 or more forbs covering 3 seasons (can include milkweed) + 1 grass (<20% of mix)	40-60 seeds per sq. ft. (***high end of range more beneficial if seed broadcast)***	0.5 to 2.5 acres per project

Plant material requirements and spacing (for live plants- plugs, potted, bareroot, etc.)	
Plant form	**Monarch Habitat**
Trees	12 x 12 feet to 20 x 20 feet based on tree size at maturity
Shrubs	6 x 6 feet to 12 x 12 feet based on shrub size at maturity
Herbs: plugs (milkweed or other wildflowers and grasses), tublings, sprigs, bareroot or potted	Use spacing of 18"- 24"for plugs or up to 36“- 48’” for larger plants/pots. Cluster or plant in rows. If clumping, plant seedlings in groups of 10 to 20, 2-5 feet apart. Clumps can be situated about 25 feet apart with a goal of 1,000 to 2,000 small plugs or 500 to 1,000 larger potted plants per acre.

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, Buckwheat	Less than 20 lbs. per acre	sawdust	rice hulls	cat litter (clay bentonite)
Brown-top millet	Less than 8 lbs. per acre	sand	cracked corn	
Do not use: winter wheat, winter rye, perennial rye, or introduced clovers		soy hulls	pelletized lime	

Planting Dates			
Time	**From**	**To**	**Recommended for**
Frost	February 1	March 15	Native grasses, wildflowers
Spring: Spring planting should occur prior to last frost (coastal plain- April 1, piedmont- April 15)	March 15	June 1	Native grasses
Fall: Fall planting should be finished at least 6 weeks before hard-freezing weather occurs (coastal plain- Oct. 20, piedmont- Oct. 10)	September 1	October 20	Wildflowers, live herbs (plugs, pots, etc.)
Dormant: [it is important to wait until the soil temperature has cooled to less than 55 degrees Fahrenheit (Nov.- mid Feb.)]	November 15	freeze	Trees, shrubs, wildflowers, live herbs (plugs, pots, etc.)
Winter	freeze	March 15	Trees, shrubs

List of planned species and rates should be generated with the SC NRCS native seed calculator and provided. This list is a starting point. Work with a seed vendor or nursery to obtain appropriate plant materials, make substitutions as needed based on available plant materials and site conditions. Modified lists of species and rates must be approved by NRCS before practice is installed. Examples of seed mixtures and a list of woody plants preferred by monarchs are provided below. There are many plant mixture possibilities.

Mixture and Planting Rate of Seeded Species: Dry site, sun to part shade - **EXAMPLE to support Monarchs**					
Common Name	**Scientific Name**	**Seeding Rate (lb/A)**	**% of Mix**	**Flowering Period**	**Growth Habit**
Milkweed, Common	*Asclepias syriaca*	3	8%	sum	P
Milkweed, Eastern Swamp	*Asclepias incarnata*	2	8%	fall	P
Milkweed, Butterfly	*Asclepias tuberosa*	1	4%	sum	P
Wild Blue Lupine (legume)	*Lupinus perennis*	2.5	2%	sprg	P
Beard Tongue, Appalachian (SC ecotype)	*Penstemon laevigatus (SC)*	0.06	9%	sprg sum	P
Phlox, Annual	*Phlox drummondii*	0.7	9%	sprg sum	A
Blazing Star, Grass-leaf	*Liatris graminifolia / L. pilosa*	0.8	8%	sum	P
Blazing Star, Marsh or Spiked (FL ecotype)	*Liatris spicata (FL)*	0.8	6%	sum fall	P
Partridge Pea-Small Flowered (legume)	*Cassia nictitans / Chamaecrista nictitans*	1.5	6%	sum fall	A
Aster, Smooth Blue	*Aster laevis / Symphyotrichum laeve*	0.2	9%	sum fall	P
Sunflower, Ox Eye	*Heliopsis helianthoides*	1	8%	sprg sum fall	P
Ironweed, Giant (FL ecotype)	*Vernonia gigantea or altissima (FL)*	0.3	5%	sum fall	P
Goldenrod, Showy (GA, WV ecotypes)	*Solidago speciosa (GA, WV)*	0.1	9%	sum fall	P
Indiangrass, Yellow (NC ecotype)	*Sorghastrum nutans (Suther)*	0.8	8%		P
	Total lb seed/acre:	14.8			
	Seed/sq foot	41.8			

Monarch on Goldenrod (*Solidago*, by Dale Buchner)

Monarch caterpillar feeding on milkweed (by Dale Buchner)

Mixture and Planting Rate of Seeded Species: Moist, sun to part shade site - EXAMPLE to support Monarchs					
Common Name	**Scientific Name**	**Seeding Rate (lb/A)**	**% of Mix**	**Flowering Period**	**Growth Habit**
Milkweed, Common *	*Asclepias syriaca*	3.5	9%	sum	P
Milkweed, Eastern Swamp *	*Asclepias incarnata*	2.5	11%	fall	P
Aster, Smooth Blue*	*Aster laevis / Symphyotrichum laeve*	0.1	5%	sum fall	P
Beggarsticks, Bearded/Showy Tickseed* (NC, SC ecotypes)	*Bidens aristosa (SC, NC)*	0.5	4%	sum fall	A
Boneset* (FL ecotype)	*Eupatorium perfoliatum (FL ecotype)*	0.03	3%	fall	P
Blue Vervain*	*Verbena hastata*	0.03	3%	sum fall	P
Smartweed, Pennsylvania /Pinkweed	*Polygonum pensylvanicum (Persicaria pensylvanica)*	0.5	3%	sprg	P
Goldenrod, Early*	*Solidago juncea*	0.2	8%	sprg sum	P
Joe Pye Weed, Trumpetweed*	*Eupatorium fistulosum (Eutrochium fistulosum)*	0.1	9%	sum fall	P
Wild Indigo, White* (legume)	*Baptisia alba*	0.6	1%	sprg	P
Sunflower, Ox Eye *	*Heliopsis helianthoides*	0.5	4%	sprg sum fall	P
Ironweed, Giant* (FL ecotype)	*Vernonia gigantea or altissima (FL)*	0.5	9%	sum fall	P
Lobelia, Great Blue	*Lobelia silphilitica*	0.02	9%	sum fall	p
Indian Blanket/Blanketflower, Annual*	*Gaillardia pulchella*	0.8	10%	sprg sum fall	A
Panicum, Beaked or Fall (grass) - SC, GA, FL ecotypes	*Panicum anceps (SC, FL, GA ecotype)*	0.4	12%		P
	Total lb seed/acre:	10.3			
	Seed/sq foot	41.5			

Sweat bee on Swamp Milkweed (by Nancy Adamson)

Monarch on Swamp/Narrow-leaved Sunflower (*Helianthus angustifolius*, by Judy Stierand)

Woody plants preferred by monarchs for nectar

Common Name	*Scientific name*	bloom	bloom	bloom	region	moisture needs	sunlight needs
Blueberry, Highbush	*Vaccinium corymbosum*	sprg			All	low to high	sun to shade
Buttonbush	*Cephalanthus occidentalis*		sum		All	moderate to high	part shade, shade
Devil's-walking-stick	*Arailia spinosa*		sum		All	low to moderate	sun to part shade
Dogwood, Flowering	*Cornus florida*	sprg	sum		All	low	part shade, shade
Elder, Marsh / Jesuit's bark	*Iva frutescens*			fall	CP	high	sun
Groundsel Tree	*Baccharis halimifolia*			fall	All	high	part shade
Hercules's Club	*Zanthoxylum clava-herculis*	sprg			CP	low to moderate	sun
New Jersey Tea	*Ceanothus americanus*		sum		All	low	sun to part shade
Ninebark	*Physocarpus opulifolius*	sprg			All	low	sun to shade
Redbud (legume)	*Cercis canadensis*	sprg			All	low to moderate	sun to shade
Serviceberry	*Amelanchier arborea*	sprg			All	moderate	sun to shade
Spicebush	*Lindera benzoin*	sprg			All	moderate	sun to shade
Sumac, Fragrant	*Rhus aromatica*	sprg	sum		P	low	sun to part shade
Sumac, Smooth	*Rhus glabra*	sprg	sum		P, M	low	sun to shade
Sumac, Staghorn	*Rhus typhina*		sum		P, M	low	sun to shade
Sumac, Winged	*Rhus copallinum*		sum		All	low	sun
Sweet Pepperbush	*Clethra alnifolia*		sum		CP, P	high	sun to part shade
Virginia Creeper	*Parthenocissus quinquefolia*		sum		All	low	sun to shade
Willow, Black	*Salix nigra*	sprg			All	high	sun to shade
Willow, Carolina	*Salix caroliniana*	sprg			CP, P	high	part shade
Willow, Silky	*Salix sericea*	sprg			All	high	sun to shade
Witchhazel	*Hamamelis virginiana*			fall	All	moderate	part shade, shade

Monarchs nectaring on Groundsel Tree (*Baccharis halimifolia*) during fall migration (by Billy McCord)