

Planting for Pollinators:

Grow Native, Go Native

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Monarch and Pollinator Coordinator





Pollinator Overview • Habitat Requirements • How You Can Help

Leslie Cooper

Monarch and Pollinator Coordinator • Quail Forever

Overview

1. Monarchs in Arkansas
2. What is Arkansas Doing
3. “Monarch and Pollinator Habitat”
4. Resources
5. Success Stories

Meet the Pollinators

6 Main Invertebrate Groups

- Butterflies
- Flies
- Moths
- Wasps
- Beetles
- Bees

“Bees are the only pollinators to consume pollen and nectar as larvae and adults...

Bees are the preeminent pollinators in most landscapes because they’re the only animals that are intentionally moving pollen through the landscape.”

– Rich Hatfield (Xerces Society)



Native Bees

Approximately 4,000 species of native bees in N. America

Native bees have special habitat requirements:

1. Foraging Habitat
2. Nesting Habitat
3. Overwintering Habitat



Native Bees in Arkansas

- This collection represents approximately 200 species of native bees
- Arkansas likely has 400-650 species of bees



Photo Courtesy of Coleman Little.



Generalists vs Specialists

European Honey Bees (*Apis mellifera*)

- Important pollinators to agriculture
- Managed pollinators
- Can also forage on native plants
- Plight of the pollinators



Solitary vs Social Bees

- More than 90% are solitary bees
 - Each female constructs and provisions her own nest without any help from other members of her species
 - Less aggressive than honey bees typically because they don't have a hive to defend
- Bumble bees are the best-known native social bees
 - 200+ species of sweat bees that sometimes nest socially

The Xerces Society Guide: Attracting Native Pollinators (Mader et al. 2011)

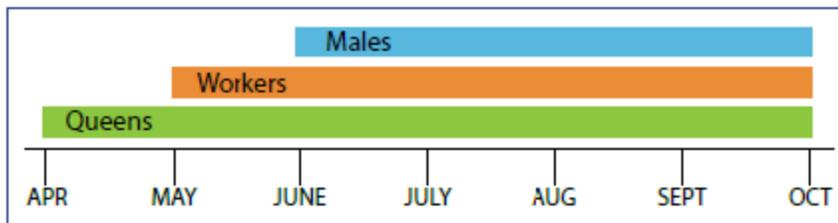


Bumble Bees

- 47 *Bombus* species in N. America
- Annual colonies
- Cavity-nesters
 - Tree cavity
 - Tussock of grass
 - Abandoned rodent nest
- Sonication or Buzz-Pollination



THE FLIGHT SEASONS OF A BUMBLE BEE



Bumble bee colonies produce workers, males, and queens at different times of year.

Ground-Nesting Bees

- About 70% of N. America's native bees (roughly 2,800 species) are solitary ground-nesters
- Dig in bare or sparsely vegetated soil, depending on species:
 - Varies from flat ground to vertical banks
 - Nest configurations range from a single short tunnel, to complex, branching tunnel systems



Wood- and Tunnel-Nesting Bees

- About 30% of N. America's native bees (around 1,200 species) are tunnel-nesters
- Many tunnel-nesting species use:
 - Abandoned beetle burrows in standing dead trees or limbs
 - Some chew out pith of dead, dry stems and twigs from such plants as elderberry and blackberry



How to Create Habitat for Stem-nesting Bees



WINTER

Leave dead flower stalks in-tact over the winter.

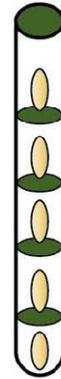
FALL



WINTER



Bees hibernate in stems during the winter.

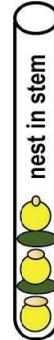


SPRING

Cut back dead flower stalks leaving stem stubble of varying height, 8 to 24 inches, to provide nest cavities.



Female bees find cut or naturally-occurring open stems, start a nest, then lay an egg on the pollen balls. Larvae eat the pollen.



SPRING

Cut back dead flower stalks. Old stem stubble will naturally decompose.



Adult bees emerge and start nests in newly cut dead stems or in naturally-occurring open stems.

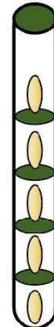


SUMMER

New growth of the perennial hides the stem stubble.



Bee larvae develop in cut dead stems during the growing season.



Bee Houses

- Be wary of mass-produced bee houses
 - Not proper dimensions
 - May not be able to be properly sanitized
- Check Xerces Society website for these handouts:
 - “Tunnel Nests for Native Bees”
 - “Nests for Native Bees”

Remember, the key message always comes back to planting Arkansas Native Plants

INVERTEBRATE CONSERVATION FACT SHEET

Tunnel Nests for Native Bees

Nest Construction and Management

There are many simple and successful ways to make artificial nests for native bees. However, keeping the nests clean is important to limit disease build-up and maintain healthy bee populations.

About 30 percent of the four thousand species of bees native to North America nest in small tunnels such as hollow plant stems, abandoned horner-beetle holes in snags, and similar locations. This includes some of our best known native bees, the blue orchard bees and leafcutters. The absence of these features in intensively farmed landscapes can limit nesting opportunities for these important crop pollinators.

Artificial nests consisting of wood blocks drilled with a large number of dead-end tunnels have been promoted as a way to attract bees and boost their local populations. This can be an effective way to enhance bee populations but these nests do need some tending to maintain the benefits. This fact sheet provides an overview of tunnel-nesting bee biology, and guidance on how to make and manage nests.

Written by Eric Mader, Matthew Sheppard, Mace Vaughan, and Jessa Guise

The Xerces Society for Invertebrate Conservation
www.xerces.org

BRING BACK THE POLLINATORS



Artificial nest sites like bamboo tubes in a plastic bucket are effective, but need maintenance. Photograph by Eric Mader.

TUNNEL-NESTING BEE BIOLOGY

The vast majority of native bee species, including tunnel-nesting bees, lead solitary lives. While they may have gregarious tendencies, preferring to nest near other members of their species, each female individually constructs her own nest and provisions it with food for her offspring.

To make a nest, a female bee builds partitions to divide the tunnel into a linear row of brood cells. Depending on the species, the partitioning walls may be constructed of mud, plant resins, leaf pieces, flower petals, and even cellophane-like glandular secretions.

The female provisions each brood cell with a mixture of pollen and nectar, onto which she lays a

INVERTEBRATE CONSERVATION FACT SHEET

Nests for Native Bees

Pollinators are a vital part of a healthy environment. Native bees are North America's most important group of pollinators. Nest sites are simple to



on of home-made bee nests: (clockwise from left) wooden block, bamboo bundle, and bumble bee box.

ators are a diverse and fascinating group of animals. In addition to their beauty, tors provide an important link in our environment by moving pollen between i and ensuring the growth of seeds and fruits. The work of pollinators touches as every day through the food we eat. Even our seasons are marked by their he bloom of springtime meadows, summer berry picking, pumpkins in the fall.

are 4,000 species of native bees in North America. Together they form the mportant group of pollinators. Like all wildlife they are affected by changes in dsclapes, especially the loss of nesting sites. Bees make nests in which they and provision brood cells for their offspring. In many modern landscapes, a for neatness has usually resulted in the removal of bare ground, dead trees, tidy corners of rough grass—all important nesting sites for bees.

act sheet gives information on how to provide nest sites for native bees, ng nest blocks and bare ground for solitary-nesting bees, and nesting boxes nble bees.

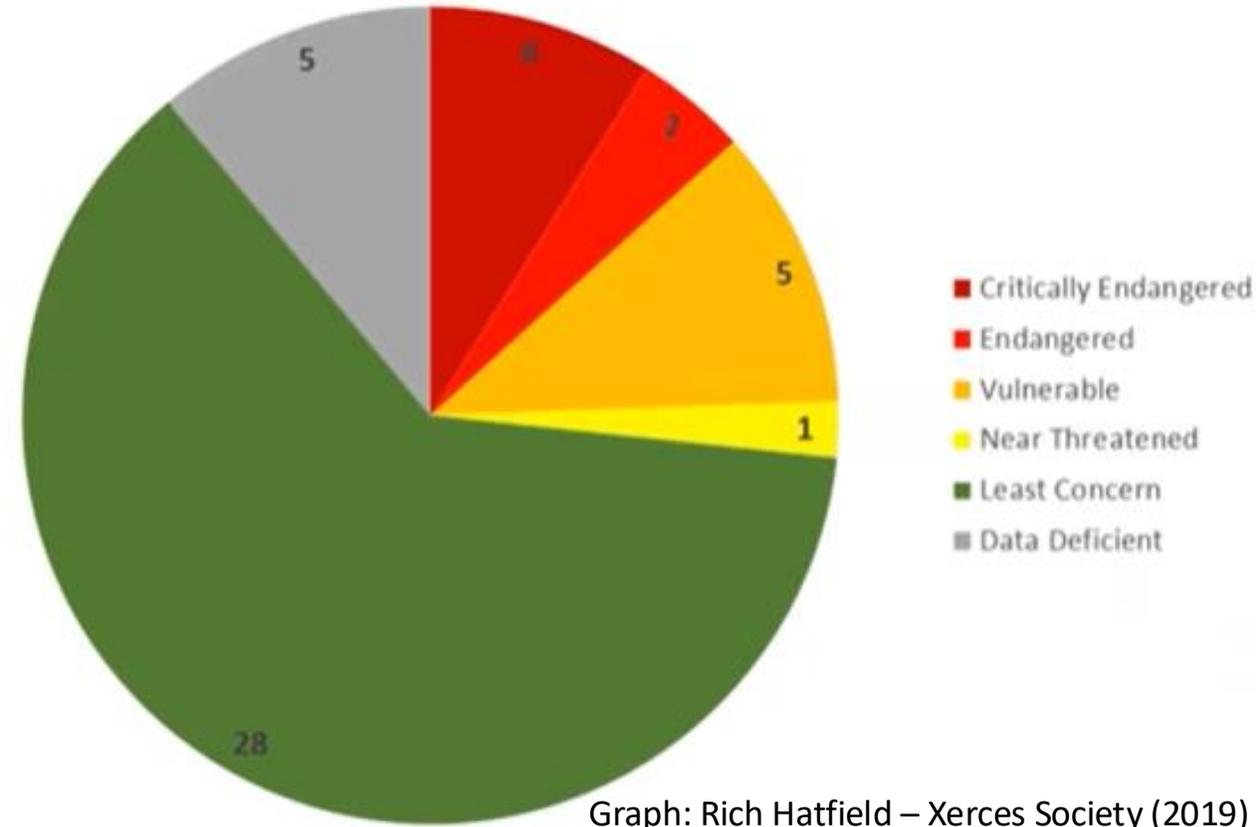
ore information, visit our web site, www.xerces.org, where you will find other leets and more detailed guidelines on how to enhance habitat for pollinators. also find information about *Attracting Native Pollinators*, *Protecting North a's Bees and Butterflies*.

Native Bee Populations Are in Decline



Bumble Bees of North America

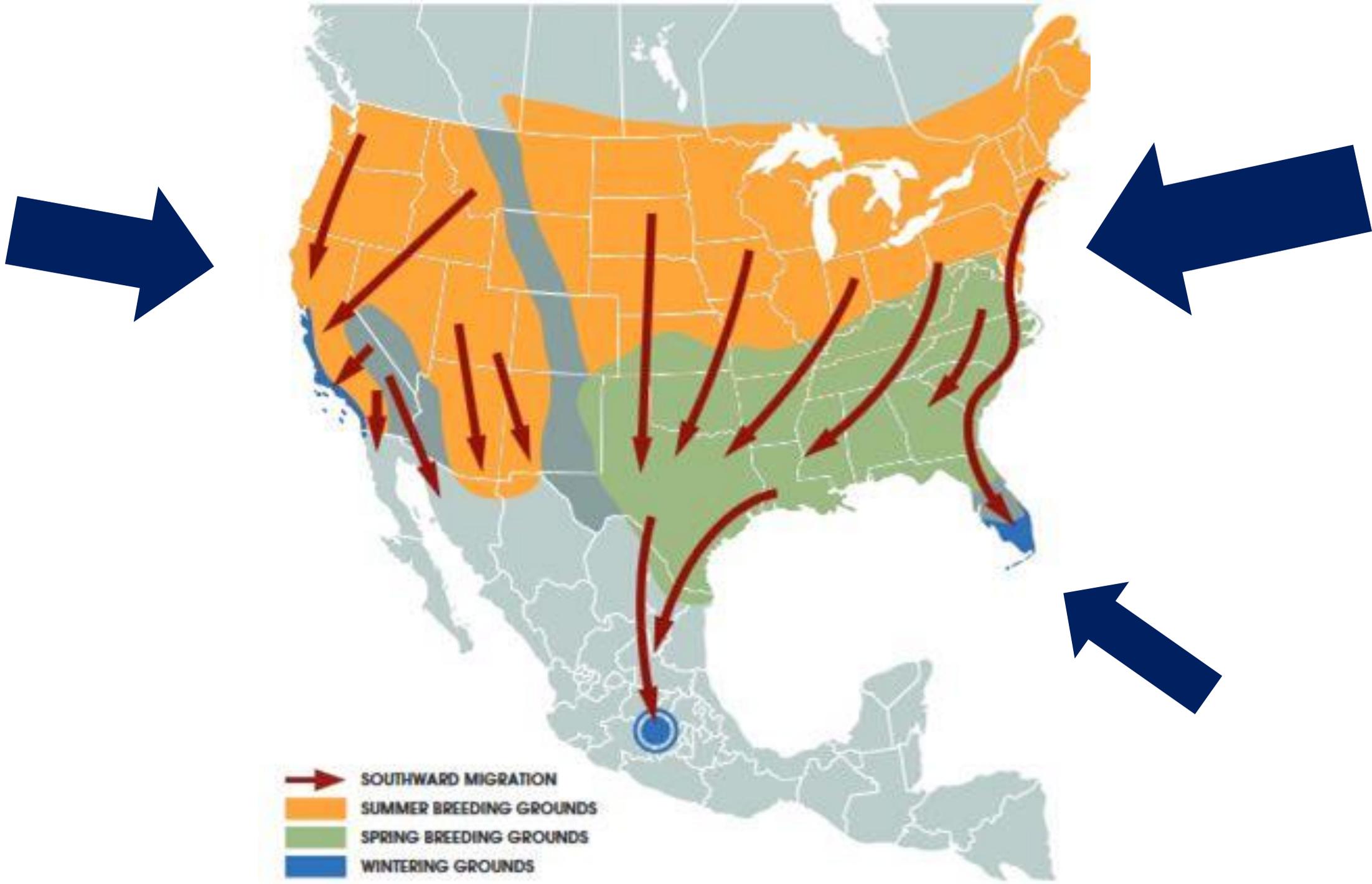
- Not much is known about our native bee species
 - Biology
 - Populations/distribution
- 40% of pollinator species may be at risk of extinction
- Bumble Bee
 - In N. America, $\frac{1}{4}$ of all bumble bee species are in a threatened or near threatened category (source: IUCN Redlist)



ESA and AWAP

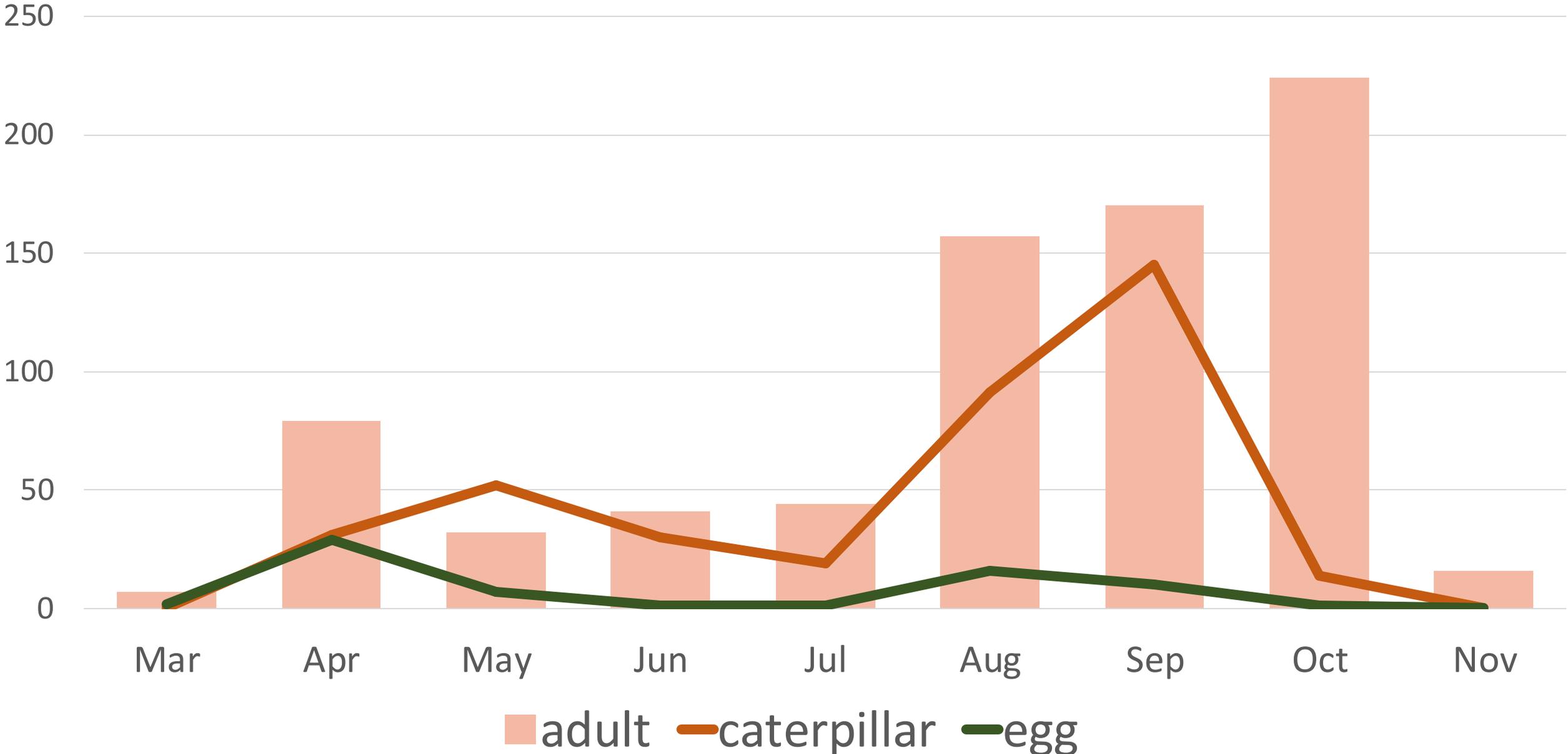
- Petition to List
 - *Bombus pensylvanicus*
 - *Bombus fraternus*



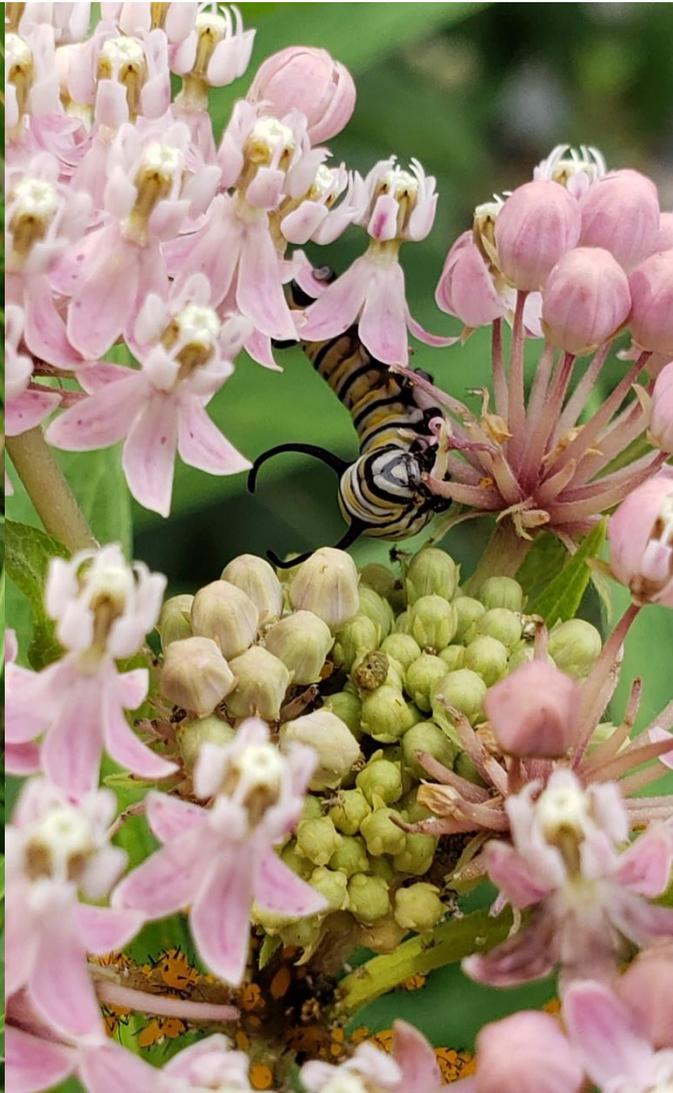


Monarch Observations in Arkansas

2014* - 2025



Monarch caterpillars are host plant specialists



Guide to Arkansas Native Milkweeds



Arkansas Native Milkweeds

There are 21 native species of milkweed in Arkansas in five different genera (*Asclepias*, *Cynanchum*, *Funastrum*, *Gonolobus*, and *Matelea*). All native milkweeds described below have milky sap characteristic of milkweeds, host larval monarch butterflies, and support native bees and other beneficial insects, unless otherwise indicated. Many milkweeds prefer full sun and tolerate dry conditions once established, but some tolerate shade and more moist conditions. Native Arkansas milkweeds are all deciduous perennials.

Milkweeds are the host plant for the monarch butterfly. Without milkweeds, there would be no monarch butterflies.

Clasping Milkweed		<i>Asclepias amplexicaulis</i>
Tall Green Milkweed		<i>Asclepias hirtella</i>
Swamp Milkweed		<i>Asclepias incarnata</i>
Pineland Milkweed		<i>Asclepias obovata</i>
Aquatic Milkweed		<i>Asclepias perennis</i>
Purple Milkweed		<i>Asclepias purpurascens</i>
Four-Leaved Milkweed		<i>Asclepias quadrifolia</i>
Narrow-Leaved Milkweed		<i>Asclepias stenophylla</i>
Common Milkweed		<i>Asclepias syriaca</i>
Butterfly Milkweed		<i>Asclepias tuberosa</i>
Red Ring Milkweed		<i>Asclepias variegata</i>
Whorled Milkweed		<i>Asclepias verticillata</i>
Green Comet Milkweed		<i>Asclepias viridiflora</i>
Green Antelopehorn Milkweed		<i>Asclepias viridis</i>
Honeyvine		<i>Cynanchum leave</i>
Twinevine		<i>Funastrum cynanchoides</i>
Anglepod		<i>Gonolobus suberosus</i>
Climbing Milkweed		<i>Matelea baldwyniana</i>
Milkvine		<i>Matelea cynanchoides</i>
Oldfield Milkvine		<i>Matelea decipiens</i>
Hairy-Face Spiny Pod		<i>Matelea hirtelliflora</i>

ArkansasMonarchs.org

Popular Milkweeds for Gardens

Commercial availability for milkweed species varies, however many native plant sellers in Arkansas offer several species that are generally hard to find.



Butterfly Milkweed | *Asclepias tuberosa*
 Bloom Period: May - Sept. Sun: Full Water: Dry to Medium
 Flower Color: Orange, rarely yellow or red
 Comments: Does well in gardens, easily germinates from seed and does well in poor, dry soils



Swamp Milkweed | *Asclepias incarnata*
 Bloom Period: June - Sept. Sun: Full to Part Water: Medium to Wet
 Flower Color: Light pink or purple
 Comments: Does well in garden setting; easily germinates from seed



Green Antelopehorn Milkweed | *Asclepias viridis*
 Bloom Period: March - Sept. Sun: Full Water: Dry to Medium
 Flower Color: Green, with touches of purple
 Comments: Easily grown from seed and does well average, well-drained soils



Tall Green Milkweed | *Asclepias hirtella*
 Bloom Period: May - Aug. Sun: Full to Part Water: Dry to Medium
 Flower Color: Pale green, may have white or purple tips
 Comments: Does well in gardens; does well in hot, dry conditions, but tolerates moist garden conditions and part shade. Spreads by rhizomes, but not considered aggressive



Whorled Milkweed | *Asclepias verticillata*
 Bloom Period: April - Oct. Sun: Full to Part Water: Dry to Medium
 Flower Color: White
 Comments: Does well in hot, dry conditions, but tolerates moist garden conditions and part shade. Spreads by rhizomes, but dainty.

It is strongly recommended that only Arkansas native milkweeds are used in home gardens. Be wary of any falsely labeled plants for sale and shop by scientific name. The non-native Tropical milkweed (*Asclepias curassavica*) is commonly confused with the native butterfly milkweed (*Asclepias tuberosa*) because of its similarly colored flowers.



Scan for full guide to Arkansas native milkweeds

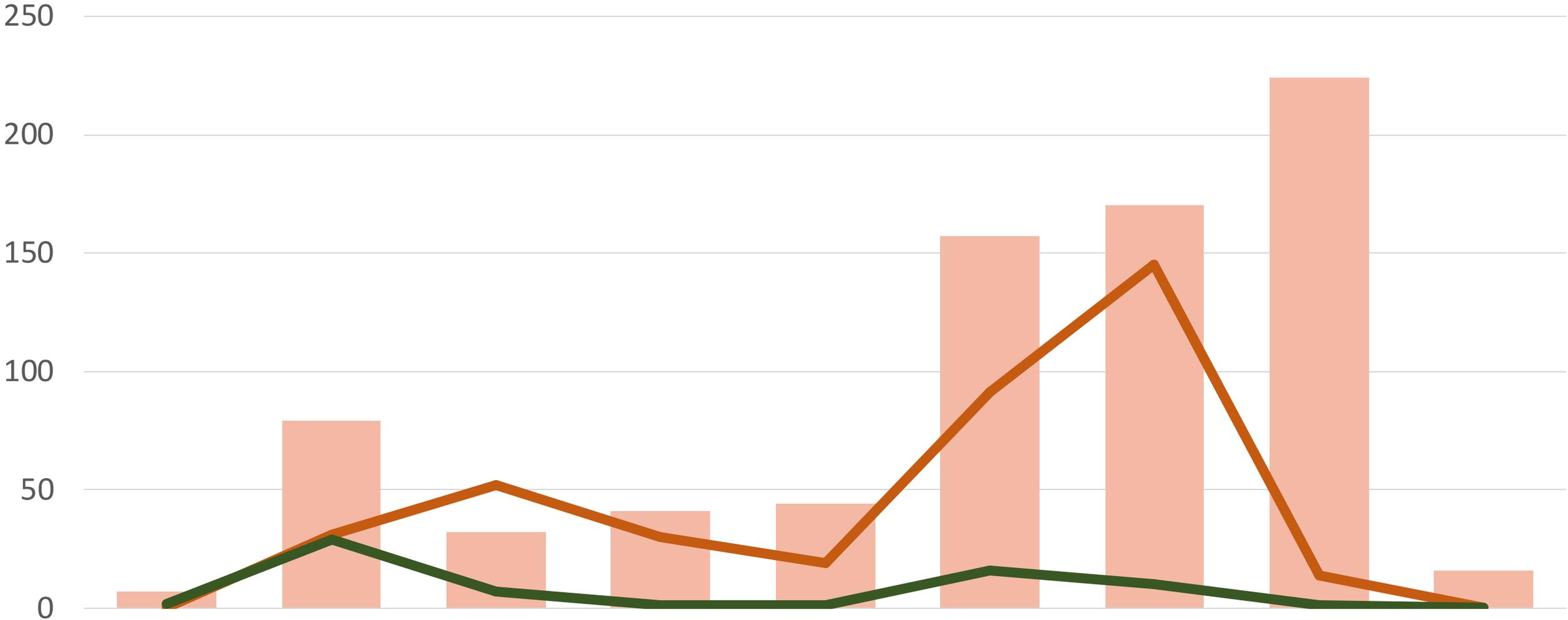
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Monarch Observations in Arkansas

2014* - 2025



■ adult — caterpillar — egg



Create Habitat!
Plant Arkansas Natives!

Remember: Not All Pollinator Habitat Has To Be Planted







Best Plants for Pollinators?

It depends!

The best plants for pollinators, are
the native plants that will grow in
the conditions of your yard

oversimplified, but still a good rule of thumb

Some* Monarch Favorites

- Milkweeds (*Asclepias* spp.)
- Mountainmints (*Pycnanthemum* spp.)
- Asters (*Symphyotrichum* spp.)
- Blazingstars (*Liatris* spp.)
- Ironweeds (*Vernonia* spp.)
- Joe Pye (*Eutrochium* spp.)
- Coneflowers (*Echinacea* spp.)
- Goldenrods (*Solidago* spp.)
- Beebalm (*Monarda* spp.)
- Sunflowers (*Helianthus* spp.)

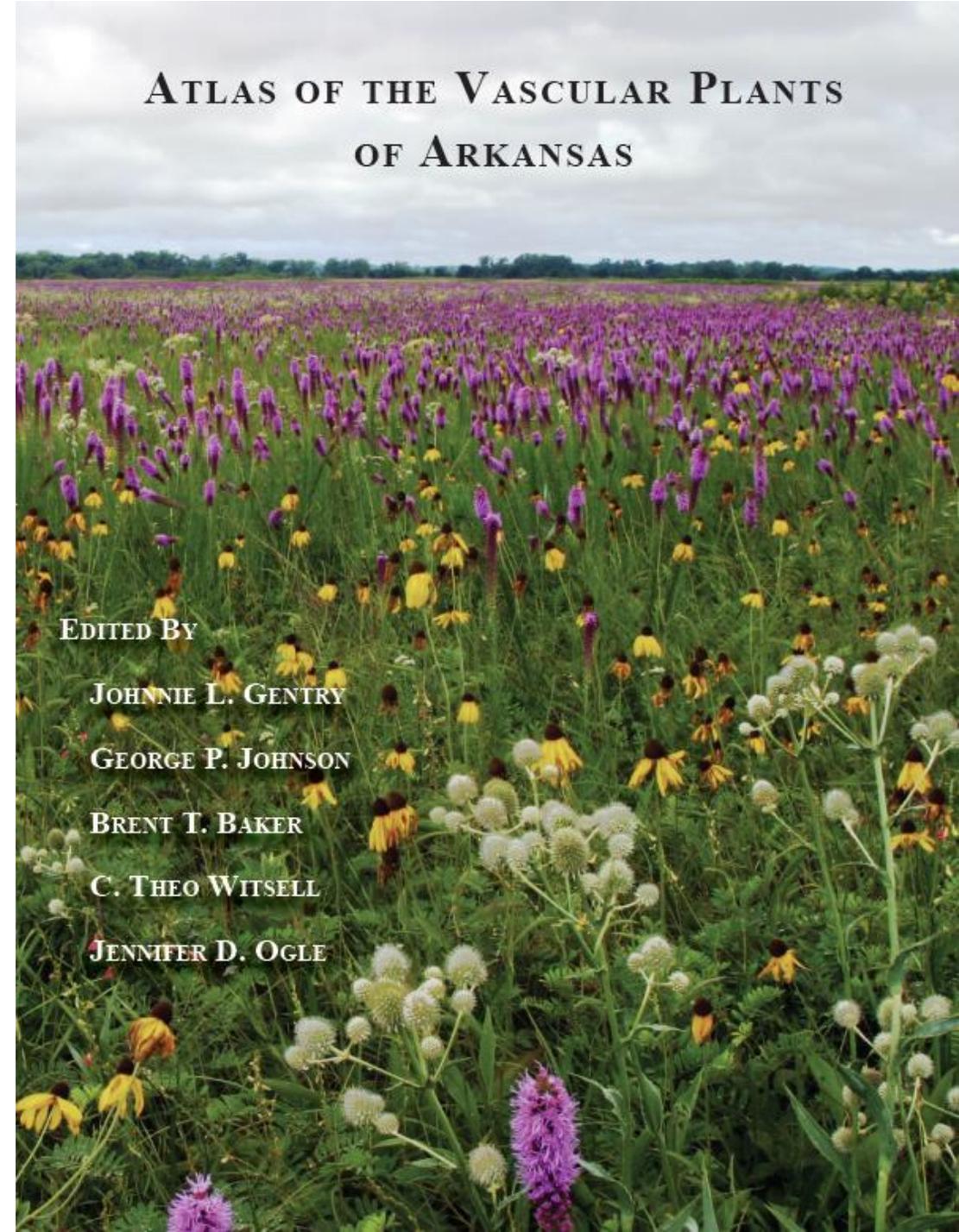
REMEMBER, we're aiming for a diversity of native blooms throughout the growing season. This is just a list of examples.



Goldenrod spp.

How Do I Know WHAT Is Native?

- BONAP – website
 - County-level data
 - USDA PLANTS database is similar
- Atlas of the Vascular Plants of Arkansas
 - Free pdf download
- Lady Bird Johnson Wildflower Center
 - Limited – only gives native ranges to the state-level
 - Some valuable info on plant characteristics that BONAP/PLANTS/Atlas do not provide
 - Good resource for general public and photos



Native Pollinator Garden

Using BONAP



Option 1: TDC-Q Page cont.

4. To the right of the "Species" column, maps will appear showing the species' native distribution. The map that is in the upper left-hand corner shows the county-level distribution (as indicated by the black arrow in Image 2).

- If you click this map, a larger image appears on a new tab (Image 3).
- If you're not familiar with what the colors mean, the link to "Map Color Key" (Image 4) appears as a hyperlink directly above the maps, to the right of the picture of the map.

5. Summary - The light green color indicates that the species has been historically recorded in that county. If a species is native and present in any county in the state, then the entire state is colored dark green.

- Example 2: Image 5 shows a county distribution map for a non-native, invasive species, sericea lespedeza (*Lespedeza cuneata*). It shows that all of a state will be colored even if the species is only recorded in a single county within the state.

6. To start a new search, you can either type a new genus and species into the same yellow box, or you can click the red box, "Name Reset", in the upper right hand corner of the "Species" column.

7. On the rare occurrence that a species is not in the BONAP database, first check to see if the scientific name has changed by googling it.

Alternative Websites to Use as Resources

Though BONAP is one of our go-to resources, there are other tools that are a little more user-friendly and include additional information. We encourage you to use multiple tools in your search.

- Lady Bird Johnson Wildflower Center
 - <https://www.wildflower.org/plants/>
- USDA PLANTS Database
 - <https://plants.usda.gov/home>

BONAP's Taxonomic Data Center (TDC)
North American Vascular Flora

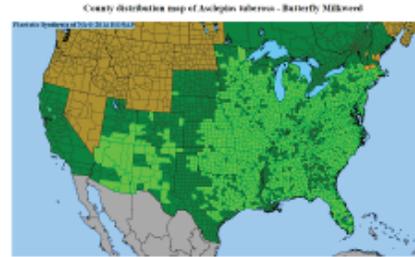


Image 3: A larger county distribution map will open in a new tab. This makes it easier to see which counties are highlighted.



Image 4: There are "state" colors and "county" colors, depending on the status of the species (native, non-native, etc.).

BONAP's Taxonomic Data Center (TDC)
North American Vascular Flora

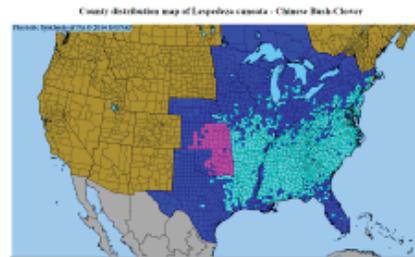


Image 5: Example of a non-native, invasive species distribution map. In some states this species is classified as "noxious".

Native Pollinator Garden

Using BONAP



Option 2: Search by Genus - NAPA

This option is a useful if you're looking for a closely related species to use as a substitute in case 1) a species is not commercially-available or 2) you found a landscape plan from another state and they selected a species that is not native to Arkansas.

1. Begin on the "US County-Level Species Maps: List by Genus" page. You may use the alphabet at the top to jump to the appropriate letter. Find the genus in the list and click on it. A grid of maps will appear (Image 6).

- The map in the upper left-hand corner shows the combined native distribution of all species in the selected genus. Essentially it's all the maps compiled together.

2. For example, in Image 7, one can see that four of the *Asclepias* species pictured are native to Arkansas. You can enlarge a map by clicking on it.

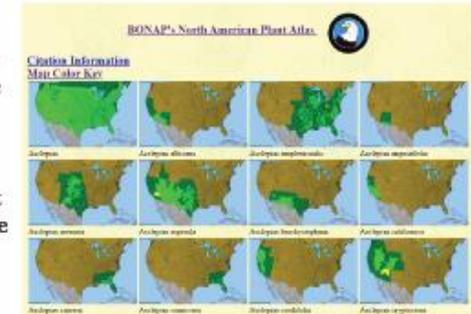


Image 6: A grid of maps opens after you click a genus from the main page.



Image 7: A screenshot from the *Asclepias* page.



What Is Arkansas Doing?

Arkansas Monarch Conservation Partnership

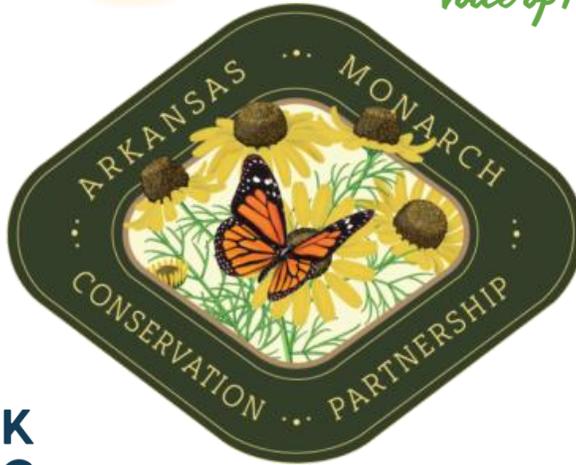


- Conservation organizations
- Agricultural organizations
- Local, state, and federal government agencies
- Private and public businesses
- Academia
- Utilities
- Private landowners





US Army Corps of Engineers®



NATIONAL CENTER FOR APPROPRIATE TECHNOLOGY



Arkansas Electric Cooperative Corporation





ARKANSAS MONARCH AND POLLINATOR CONSERVATION PLAN



MAY 2018

*Presented by the Arkansas Monarch
Conservation Partnership
Steering Committee*



ARKANSAS MONARCH AND POLLINATOR CONSERVATION PLAN



MAY 2018

*Presented by the Arkansas Monarch
Conservation Partnership
Steering Committee*

Focuses on:

1. **Habitat**
2. **Outreach and Education**
3. **Research and Monitoring**
4. **Collaborations and Partnerships**

ArkansasMonarchs.org

Monarch and Pollinator Habitat

1. High Diversity
2. The Entire Growing Season
3. Flower size, shape, and structure
4. Includes Milkweeds
5. Managing to Benefit All Pollinators and Other Wildlife









Remember: Not All Pollinator Habitat Has To Be Planted





General Considerations

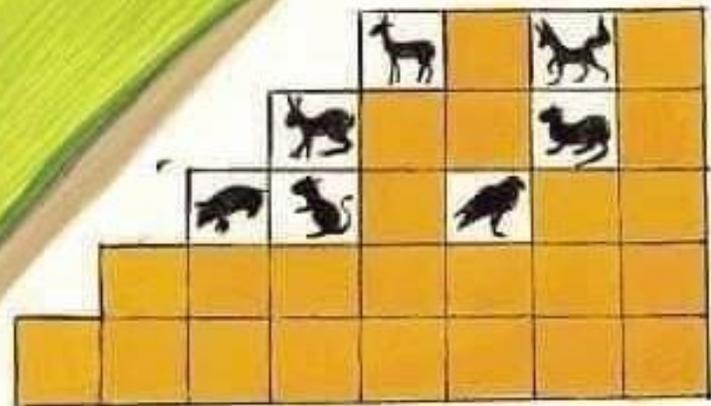
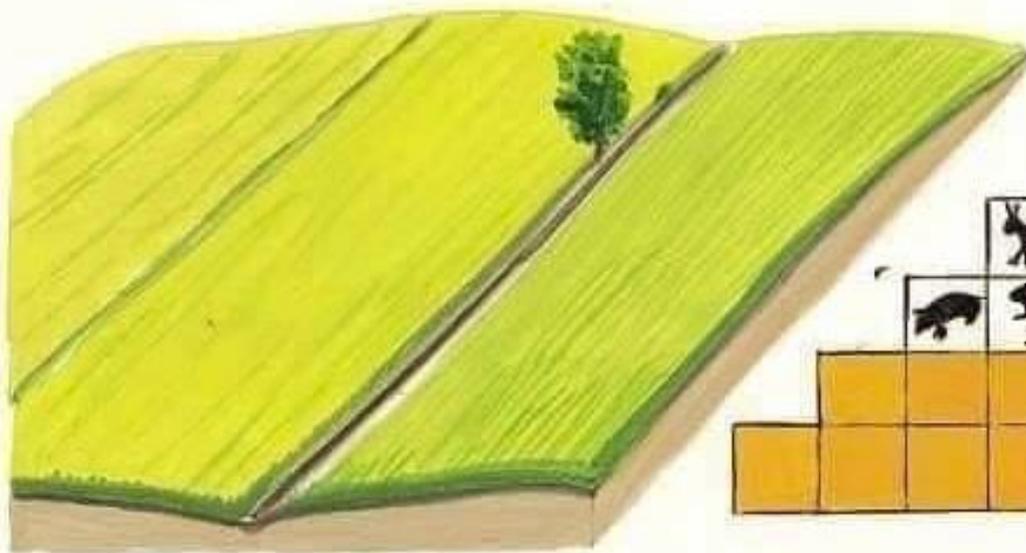
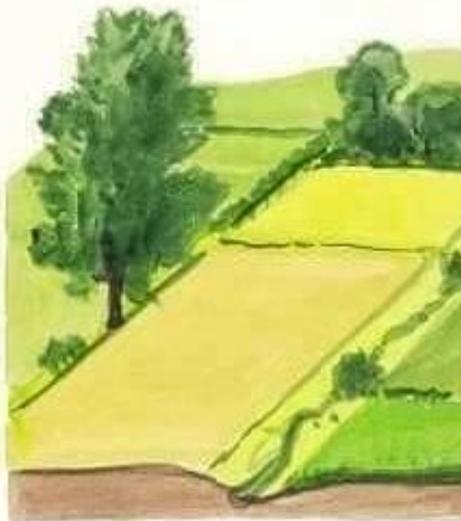
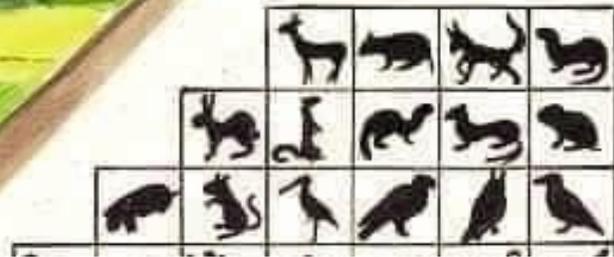
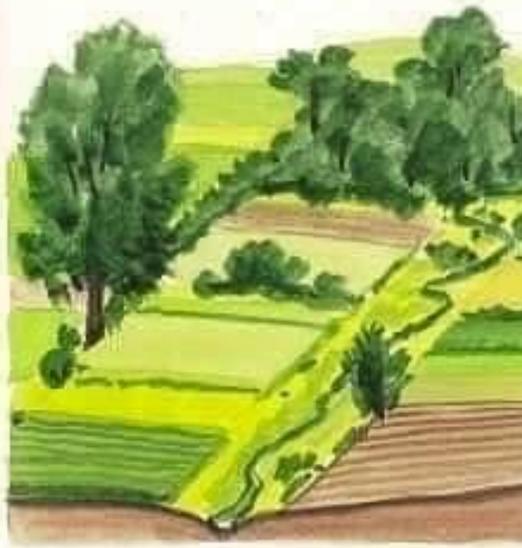
- No matter the size or establishment method SITE PREP will be the same
 - Kill existing vegetation
 - Typically non-native sod grasses
- Do NOT till the soil, especially AFTER site prep
 - Undo all site prep
 - Increase weed pressure/competition

Where To Get Plants?

Native Seed Vendors

- Large-scale projects should work with local biologist who provide free technical assistance
 - AGFC Private Lands Biologists
 - Quail Forever Farm Bill Biologists
- Ecoregion seed mixes
 - Think of them as “recipe cards”
 - Quotes from vendors

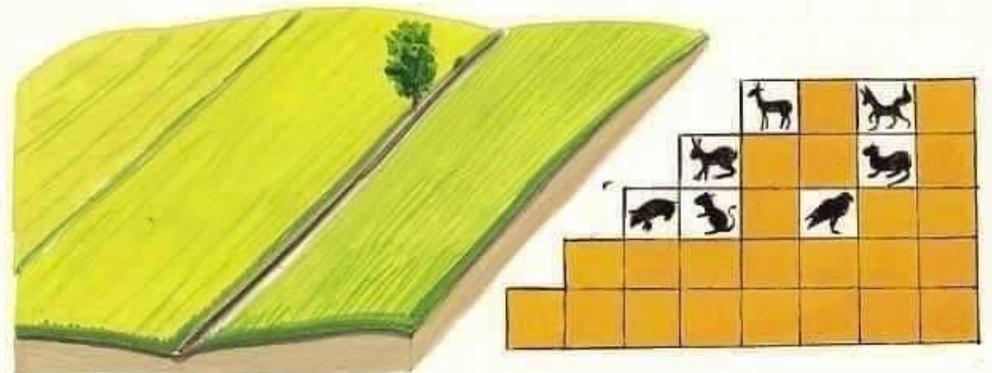
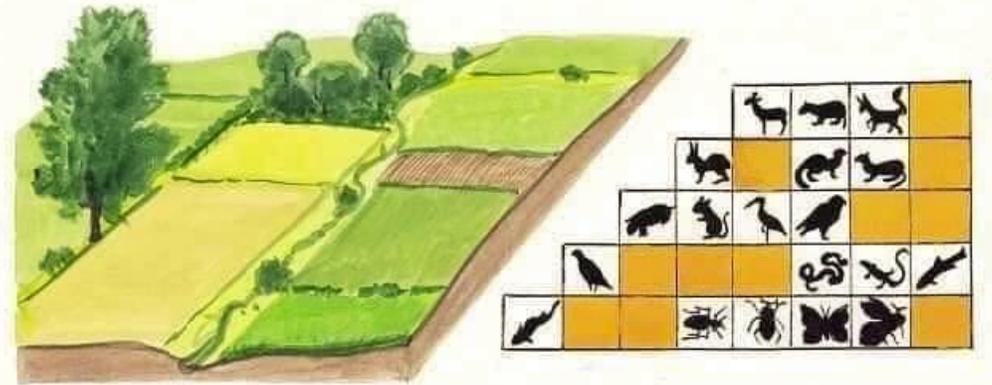
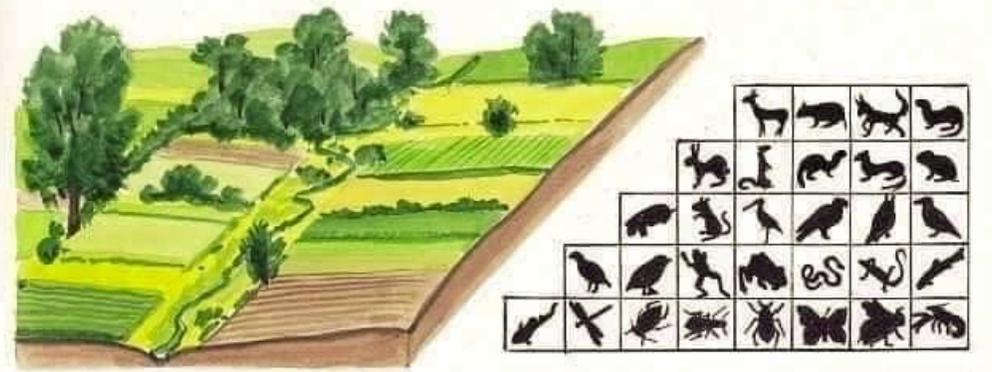




Importance of Biodiversity

As simple as it sounds...

- The more diverse a landscape/habitat/system is, the more life it supports and the healthier the ecosystem
- Not just an example for agriculture...
 - Lawns
 - Monocultures



Expectations





Key Steps to Using a Drop- or Broadcast Spreader:

1. Set the flow control to the lowest setting possible to start and work your way up from there. This will ensure that seed does not flow out too fast in the first pass. Use a bulking agent to help control the seed flow as well. Use only broadcast equipment that has an agitator in the bottom to keep the seed well mixed and flowing.
2. Start with seed for a half acre or one acre in the broadcast seeder and cover an area measured out to that size. Check the seeder to see if the seed has run out or if any is still left and adjust as needed before planting the whole field. It is best to still have some seed left and go over the ground a couple extra passes.
3. Do not cover seed with soil. Instead use a cultipacker or turf roller to compact the seed into the soil surface. Precipitation or lightly running can ensure good seed-to-soil contact, especially if the area has been sprayed and then burned off. Rain or snow on the seed and ashes will get excellent seed-to-soil contact.

It is imperative that the seedbed be dry and firm to ensure proper planting depth. Saturated soils should never be cultipacked or planted (to avoid getting the seed too deep or caking on equipment). There has been some success with dropping seed from an airplane into saturated soils.



Figure 48—left to right: Mix seeds with bulking agents, making three or four batches, to help ensure even coverage and that you do not run out of seed with a single batch before the full area is covered. The bulking agent, in this case sand, also helps to show where the mix has landed. (Photos: Nancy Lee Adamson.)



Figure 49: Small areas can be hand-broadcast seeded after mixing seed with a bulking agent. One type of spreader, a pendulum spreader, that can be mounted on a tractor, is useful in small and large areas. Spread on to firm surface and roll after planting to ensure good seed-to-soil contact. (Photos: Nancy Lee Adamson [left, right], Ryan Diener, Quail Forever [center].)

Planting immediately following an annual row crop such as corn can be an effective approach for reduced weed competition. If it is likely that pesticides were used for crop or weed management, you must ensure ample time for residual chemicals to metabolize or be removed from the soil prior to planting. Some of these chemical residues may inhibit germination or be taken up by new plants and harm pollinators and other insects. Planners need to be mindful of this and talk to the producer about the history of the field and what has been sprayed in the past three years. See *II. Protecting Pollinators and Their Habitat* for more details on mitigating pesticide risks.

No-Till Using a Native Seed Drill

With a native seed drill, you should only plant when the soil is dry enough to not stick to the rollers or when the soil is frozen. Under wet conditions, small seeds are likely to stick to mud-caked parts of the drill and not germinate as intended.

Halictus spp.), blueberry bees (such as *Halictus rubicundus*), and skua (or hibernian) bees (*Psithyrus hibernicus*). Most are only active during a few weeks each year, with many especially important for early spring-flowering crops, such as apple and other fruit trees, blueberries, and strawberries. Native species are frequently active earlier and later in the day than honey bees. For squash and other cucurbits, squash bees and bumble bees (*Bombus* spp.) often provide early morning (sometimes pre-dawn) pollination before most other bees become active.



Figure 2—left to right: Bumble bees, flies, and bees help pollinate many cultivated crops such as peach, buckwheat, and onion, and butterflies are important pollinators of many wild and nursery or garden plants, such as Turk's cap fly (*Lilium superbum*). (Photos: Nancy Lee Adamson.)

Some plants—those in the nightshade and beet families, for example tomatoes and blueberries—require vibration, or “buzz pollination,” to release pollen from their anthers. Buzz pollination is an important service nearly all our native bees can provide by vibrating their wing muscles at a specific frequency that causes enough pressure within the anther to release pollen. Though honey bees can “buzz” for warmth, the frequency does not match what our native plants and some crops need for vibration. Since most of our native bees are solitary species, they collect nectar and pollen on every trip (to provision nest cells and for their own sustenance), making them especially effective pollinators on a bee-per-bee basis compared to honey bees, whose foragers may only collect one or the other (pollen or nectar). Honey bees can make up for their lower efficiency with concentrated numbers and mobility; plus they can be brought in at peak flowering time, which is important in areas without sufficient natural habitat to support wild bee populations year-round. Research published in 2006 estimated the value of annual crop production attributed to native bees for the United States economy at three billion dollars, but subsequent research suggests their contribution is much greater. Measures taken to improve habitat and management help maintain diverse pollinators and promote a healthy balance of pests and predators, reducing costs over time and improving production.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) can assist landowners by suggesting regionally appropriate plants and farm management practices that provide forage resources (nectar and pollen sources) and nesting habitat for organisms that provide pollination services. These plantings and farm management approaches also support a diversity of other native predators and parasitoids that help reduce crop pest populations.



Figure 3—left to right: Hummingbirds are the primary pollinators of most of our native flowers with red, tubular flowers, such as cardinal flower (*Loebelia cardinalis*) and trumpet creeper (*Campsis radicans*), but they collect nectar and insects from many other native plants like thistle (*Cirsium* spp.), Columbine (*Apulegia canadensis*), coral bean (*Erythrina herbacea*), coral honeysuckle (*Lonicera sempervirens*), and some native azaleas have tubular flowers primarily pollinated by hummingbirds. (Photos: Steve Duzan.)

¹ See *Appendix B: Species Lists* for various lists of plants (including common and scientific names) related to restoration and farming.



Figure 50—left to right: Most pollinator plantings are established using specialized drills and equipment. These plantings often follow herbicide applications or other season-long site preparation. Typical native seed drill models (A) can plant in tight stubble (B), have separate seed boxes for various seed sizes (C), and have depth controls for optimal seed placement. (Photos: Xerosa Society / Sarah Foltz Jordan.)

Four Key Steps to Using a No-Till Drill

1. Calibrate the drill based on the owner's manual from the drill manufacturer for seeding native grasses and forbs.
2. Loosely fill the seed boxes with the intended mix and do not compact the seed into the boxes. If there is not enough seed to cover the agitator, do not drill the seed or use a filler. Small volumes of seed should be broadcasted.
3. For most mixes, the depth should be set to plant no deeper than 1/4-1/2" (5mm) deep. It is common to set drills as shallow as they will possibly go for planting native seeds, you may have to have hydraulic blocks to keep the drill elevated to ensure shallow planting depth. Native seed planted deeper than 1/4" will not germinate. Stop periodically to ensure that the depth is correct throughout the planting process. Some seed should actually be seen on the surface of the ground or just barely covered.
4. The drill should be operated slowly. Never exceed 5 mph. Stop frequently to ensure the operation is functioning and seed tubes are not clogged. Fluffy seed can clog frequently and gain more inclined to clog if the drill is operating slowly.

Long-Term Maintenance for Herbaceous Plantings

Reducing weed competition during the initial years of establishment is the most important part of pollinator habitat planting success. Proper site prep and planting native seeds in the winter and getting the best possible germination in the first year is the most important part of reducing weed competition. Mechanical and chemical control are common methods for the first couple of years, if needed. Prescribed fire when the stand is well-established, or when the seeding is completely dormant in the first couple of winters, is also a great tool. A prescribed fire in December or January can help remove annual grass residue that can smother new seedlings. A “wick” or similar device may be used to selectively apply herbicides if weeds have overgrown the planting, but this would be an extreme option or for certain weed species like Johnson grass if the need arises. Generally mowing will provide sufficient weed management for pollinator planting establishment. If the weeds present are annual broadleaf species (common ragweed, marehail, etc.) they often do not require any control methods. These annual broadleaf plants have open canopies and do not typically shade out the native seedlings unless they have grown extraordinarily thick. If left to grow with the annual broadleaves, the native seedlings come up very well the second season without the annuals coming back in at all.

Mow During the First Growing Season

During the first year of growth, there will likely be a lot of annual weeds along with very small seedlings of a few perennial wildflowers and grasses. If the weeds are growing in thickly and significantly reducing available sunlight getting to the seedlings, mowing may be a good option. To allow sunlight to reach the new seedlings and prevent smothering of the new seedlings, aim to mow the new planting throughout the first season. Early in the first season, when the planting is 12" tall, mow to 6". Later in the season, when the planting reaches 18" to 18", mow to 12" or 10". This will not harm the perennials, even if a few, like black-eyed Susan (*Rudbeckia* spp.) and coreopsis (*Coreopsis* spp.) may be flowering. The mowing will allow more sunlight to reach the seedlings, stimulate root growth for those that are already taller, and prevent weeds from going to seed. If you wait until the weeds are taller, due to other priorities or difficulty accessing the site due to prolonged rain, just be sure to rake the plant material off so the new seedlings are not smothered. If you cannot rake or remove that material, it is best to not mow and just let it grow the rest of the season. The dead growth of the weeds can be removed with a prescribed burn in the winter to prepare the area for rapid seedling growth the second year.

FOUNDATION SERVICES IN ARKANSAS

Why care about pollinators? Over 100 crop species in North America require a visit from an insect pollinator to be productive and approximately one out of every three mouthfuls of food or beverage consumed requires insect pollination. Directly and indirectly, insect-pollinated crops in North America are estimated to be worth about \$10 billion annually—including food, medicines, dyes, and textile fibers.



Figure 4—left to right: Blueberries, raspberries (*Rubus* spp., shown: “Fall Gold”), and watermelons (*Citrullus lanatus*) are among the many fruits and vegetables that depend on bees for pollination. (Photos: Nancy Lee Adamson.)

Insects and flowering plants diversified and evolved together, resulting in the most widespread mutual interdependence in the natural world. In temperate zones, most “showy” flowers are pollinated by insects, especially bees. Almost all herbaceous wildflowers are insect-pollinated, as are many trees and shrubs, including dogwoods (*Cornus* spp.), redwoods (*Sequoia* spp.), wild plums (*Prunus* spp.), sassafras (*Sassafras albidum*), spicebush (*Magnolia* spp.), magnolias (*Magnolia* spp.) and willows (*Salix* spp.). Most native insect-pollinated plants are adapted to a particular group of pollinators that are active at a specific time of the year. Insects that co-evolved with depositing plants developed physical traits for picking up and depositing their host species’ pollen effectively, and the ability to digest certain phytochemicals produced by those plants. As plants are the basis of food webs, their reproduction is essential for all life, and depends on native pollinators. Therefore, if native pollinators disappear, plant diversity would decline, causing a cascade of negative effects on other species and their ecosystems. The shape, position, chemical and visual attributes of the flower determine which type of pollinator is most likely to be attracted to it. Bee-pollinated flowers are usually open and accessible, but some, such as flowers of legumes are irregular in shape, often requiring bees to distort petals and other structures to gain access to nectar. This, in turn, leads bees to pick up or drop off pollen on each visit, thus ensuring pollination in the process. Ultraviolet patches and lines (nectar guides) on petals of some flowers guide bees to nectar and pollen, increasing efficacy. Flower shapes with broad or large flares that are elevated above surrounding vegetation, such as milkweeds (*Asclepias* spp.), attract butterflies. Flies are significant in pollinating many trees, such as sassafras, and are attracted to small, open shallow or clustered flowers. Other fly or beetle species are attracted to rancid smelling blooms, like Jack-in-the-pulpit (*Arisaema reptans*), mistletoes that are carried on which to lay eggs. Hummingbirds are especially attracted to red, tubular flowers such as cardinal flower (*Loebelia cardinalis*) and coral bean (*Erythrina herbacea*). Pollen is deposited around their head, and transferred to other flowers. Other beneficial insects, including some beetles and wasps, transfer pollen as they clamber around blooms in search of food or mates.



Figure 5—Different types of pollinators are attracted to different shapes, sizes, and colors of flowers (left to right): tall thistle (*Cirsium altissimum*) with a bumble bee, Carolina rose (*Rosa carolina*) with a bee, and plantain coreopsis (*Coreopsis lanceolata*) with a syrphid fly. (Photos: Ryan Diener, Quail Forever.)

Arkansas NRCS Pollinator Conservation Planning Handbook



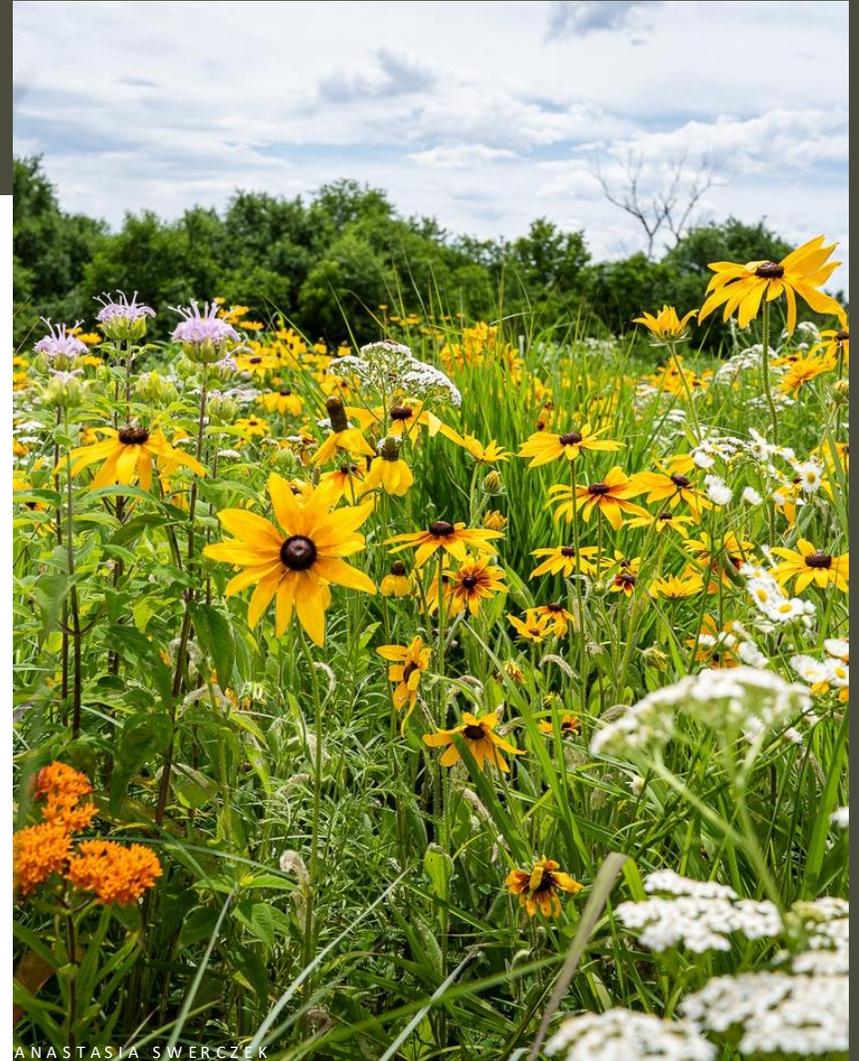
Arkansas
Natural Resources
Conservation
Service
nrcs.usda.gov/



Reminder for Leslie to touch base with Ryan for management portion of this so he's prepped

How to Establish and Manage a

Pollinator Plot



ANASTASIA SWERCZEK

POLLINATOR Establishment

- Things to consider:
 - What to plant
 - species and amount
 - When to plant
 - dormant season preferred
 - How to plant
 - broadcast or drill

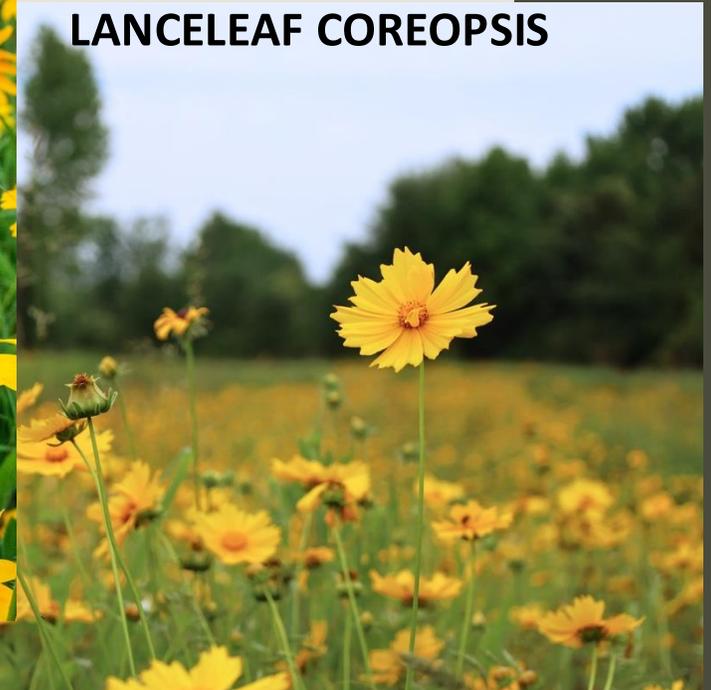
PARTRIDGE PEA



BLACK-EYED SUSAN



LANCELEAF COREOPSIS



Example Pollinator Mix

Arkansas Delta Seed Mix

Common Name	Scientific Name	PLS/ft ²	% of Mix by PLS/ft ²	PLS lbs/acre
Big Bluestem	<i>Andropogon gerardii</i>	1.515	5.2%	0.400
Fox Sedge	<i>Carex vulpinoidea</i>	0.596	2.1%	0.020
Indiangrass	<i>Sorghastrum nutans</i>	1.515	5.2%	0.400
Little Bluestem	<i>Schizachyrium scoparium</i>	3.306	11.4%	0.600
River Oats	<i>Chasmanthium latifolium</i>	0.083	0.3%	0.040
Virginia Wildrye	<i>Elymus virginicus</i>	0.275	0.9%	0.150
Ashy Sunflower	<i>Helianthus mollis</i>	0.026	0.1%	0.010
Black-eyed Susan (B)	<i>Rudbeckia hirta</i>	1.447	5.0%	0.040
Butterfly Milkweed	<i>Asclepias tuberosa</i>	0.193	0.7%	0.120
Cardinal Flower	<i>Lobelia cardinalis</i>	1.296	4.5%	0.005
Common Boneset	<i>Eupatorium perfoliatum</i>	1.653	5.7%	0.025
Common Evening Primrose (B)	<i>Oenothera biennis</i>	0.474	1.6%	0.015
Common Milkweed	<i>Asclepias syriaca</i>	0.222	0.8%	0.150
Cream Wild Indigo	<i>Baptisia bracteata</i>	0.001	0.0%	0.001
Culver's Root	<i>Veronicastrum virginicum</i>	1.084	3.7%	0.004
False Aster	<i>Boltonia asteroides</i>	0.474	1.6%	0.010
False Sunflower	<i>Heliopsis helianthoides</i>	0.202	0.7%	0.070
Foxglove Beardtongue	<i>Penstemon digitalis</i>	0.736	2.5%	0.020
Golden Alexanders	<i>Zizia aurea</i>	0.079	0.3%	0.020
Gray Goldenrod	<i>Solidago nemoralis</i>	0.116	0.4%	0.005
Green-stemmed Joe-pye Weed	<i>Eupatorium purpureum</i>	0.386	1.3%	0.025
Hoary Vervain	<i>Verbena stricta</i>	0.894	3.1%	0.070
Illinois Bundleflower	<i>Desmanthus illinoensis</i>	0.488	1.7%	0.250
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>	1.522	5.2%	0.300
Lemon Mint	<i>Monarda citriodora</i>	1.322	4.6%	0.040
New Jersey Tea	<i>Ceanothus americanus</i>	0.003	0.0%	0.001
Ohio Spiderwort	<i>Tradescantia ohioensis</i>	0.029	0.1%	0.010
Pale Purple Coneflower	<i>Echinacea pallida</i>	0.097	0.3%	0.040
Partridge Pea (A)	<i>Chamaecrista fasciculata</i>	0.149	0.5%	0.100
Plains Coreopsis (A)	<i>Coreopsis tinctoria</i>	0.666	2.3%	0.009
Prairie Blazing Star	<i>Liatris pycnostachya</i>	0.041	0.1%	0.015
Purple Coneflower	<i>Echinacea purpurea</i>	0.531	1.8%	0.200
Rattlesnake Master	<i>Eryngium yuccifolium</i>	0.102	0.4%	0.025
Rosinweed	<i>Silphium integrifolium</i>	0.007	0.0%	0.007
Rough Blazing Star	<i>Liatris aspera</i>	0.027	0.1%	0.005

Please do not provide any substitutions without approval from the local Quail Forever biologist.

Roundhead Lespedeza	<i>Lespedeza capitata</i>	0.080	0.3%	0.020
Sawtooth Sunflower	<i>Helianthus grosseserratus</i>	0.289	1.0%	0.020
Seedbox	<i>Ludwigia alternifolia</i>	1.910	6.6%	0.004
Slender Lespedeza	<i>Lespedeza virginica</i>	0.037	0.1%	0.010
Slender Mountain Mint	<i>Pycnanthemum tenuifolium</i>	2.499	8.6%	0.018
Tickseed Coreopsis	<i>Coreopsis tripteris</i>	0.092	0.3%	0.020
Tickseed Sunflower (A / B)	<i>Bidens aristosa</i>	0.164	0.6%	0.055
White Prairie Clover	<i>Dalea candida</i>	0.638	2.2%	0.100
Wild Bergamot	<i>Monarda fistulosa</i>	1.098	3.8%	0.040
Wild Quinine	<i>Parthenium integrifolium</i>	0.026	0.1%	0.010
Yarrow	<i>Achillea millefolium</i>	0.655	2.3%	0.010
Totals		29.04	100.0%	3.509

	PLS lbs/acre	PLS/ft ²	% of Mix by PLS/ft ²	Species Richness
Grasses	1.610	7.29	25.1%	6
Forbs	1.899	21.75	74.9%	40
Total	3.509	29.04	100.0%	46

Bloom Period	# of Species	% of Mix by PLS/ft ²
Spring	5	10.34%
Summer	22	48.63%
Fall	13	15.93%

Please do not provide any substitutions without approval from the local Quail Forever biologist.

Native Seed Vendors



Native Seed Vendor List

This list is a public service and constitutes no endorsement by Quail Forever of any service or business listed. While an attempt has been made to provide a complete and accurate listing, omissions or other errors may be present and therefore, other available sources of information should be consulted. For questions about the list or if you wish to have your business added, please call (636) 399-8733.

This list indicates the primary services each business offers. Other services may be available but not indicated.

Name	Address 1	City	State	Zip	Phone	Website	Email	Contact Name	Products
Hamilton Native Outpost	16786 Brown Road	Elk Creek	MO	65464	417-967-2190	www.hamiltonseed.com	natives@hamiltonnativeoutpost.com		
Pure Air Natives	4630 West Florissant Ave	St. Louis	MO	63115	636-357-6433	www.pureairnatives.com	sales@pureairnatives.com		
Quail Forever and Pheasants Forever Habitat Store		Lincoln	IL	68516	866-914-7373	www.pfhabitatstore.com	seed@pheasantsforever.org		
Roundstone Native Seed	909 Main Street	Upton	KY	42784	270-531-3034	www.roundstoneseed.com	sales@roundstoneseed.com		
Star Seed Inc	101 Industrial Ave	Osbourne	KS	67473	800-782-7311	www.gostarseed.com	bryan@gostarseed.com		
Heartland Seed of Missouri	113 Welch Rd	Eolia	MO	63344	866-476-7333	www.heartlandseed.com	info@heartlandseed.com		
Lick Skillet Seeds Inc	22324 State Highway HH	Gallatin	MO	64640	660-663-3095	www.lickskilletseeds.com	lickskilletseeds@yahoo.com		
Missouri Wildflower Nursery	9814 Pleasant Hill Road	Jefferson City	MO	65109	573-496-3492	www.mowildflowers.net	mowldflrs@socket.net		
Turner Seed Company	211 County Road 151	Breckenridge	TX	76424	800-722-8616	www.turnerseeds.com	jesse@turnerseeds.com		
Johnston Seed Co.	319 West Chestnut	Enid	OK	73701	580-249-4449	www.johnstonseed.com	johnseed@johnstonseed.com		
Bamert Seed Company	1897 County Road 1018	Muleshoe	TX	79347	806-639-5232	www.bamertseed.com	natives@bamertseed.com		
Sharp Bros Seed Company	1005 S Sycamore	Healy	KS	67850	620-398-2231	www.sharpseed.com	sales@sharpseed.com		
Produce Shed	3910 HWY 65 South	Pine Bluff	AR	71601	870-534-0272	facebook.com/produceshed	produceshed@gmail.com	Cory Tomboli	

Vendor Billing and Prices

- Native Seed Vendors are used to working with NRCS contracts.
- Often seed vendors bill people once the seed gets shipped.
- Payment is not normally up-front.
- Talk with your local Farm Bill Biologist if you have questions.

EQIP

Scenario Report

DO NOT USE THIS



Arkansas
Practice Scenarios - Fiscal Year 2024

Practice: 528 - Prescribed Grazing

Scenario: #9 - Pasture Deferment - Long Term

Scenario Description:

Defer the pasture for 210 days and up to a growing season to provide rest to specific plants such as native grasses. The rest is needed to provide long-term rest to specific plants that would typically decline in plant health, vigor, and availability due to overgrazing. The importance of long-term deferment is critical to the long term success of the plants and meeting the desired life span.

Before Situation:

The producer will typically graze the plants before they have sufficient time to become established. Therefore, any plants that emerges will be susceptible to early grazing pressure and possibly overgrazing. Existing herbaceous vegetation will compete against the desired plants and become dominant. The lack of cover reduces the wildlife habitat. No monitoring or record keeping is currently being completed. Plants not adapted or suited, inadequate wildlife cover, soil erosion, and inadequate plant productivity and vigor are common resource concerns.

After Situation:

Scenario describes activities completed to restrict grazing for a defined period during the normal grazing period to provide rest to targeted plants. Activities include moving livestock to alternate locations, sampling and analyzing pasture condition, recordkeeping. Forgone Income used represents the acreage of usable forage not utilized during the deferment period as a proportion of the grazing season. Typical size of 120 acre pasture operation with 30 animal units where 50% of the acreage (or 60 acres) is deferred from grazing for 210 days. Costs and activities are typical for conventional and organic producers. Associated Practices: (511) Forage Harvest Management, (512) Forage and Biomass Planting, (590) Nutrient Management, (595) Integrated Pest Management, (561) Heavy Use Area Protection, (382) Fence, (614) Watering Facility, (378) Pond, (642) Water Well, (314) Brush Management, (315) Herbaceous Weed Control, (338) Prescribed Burning.

Site PREPARATION



01 Key is to eliminate/reduce competing vegetation.

02 Prepare seedbed to ensure good seed/soil contact.

03 Goal is to get to at least 50% bare ground. (75-100% is better)

04 In general, fertilizer is not needed, especially N.

05 Adding lime may hinder forb establishment.

Site PREPARATION

Good

Bad



PLANTING Methods

- Drill or Broadcast
 - depends on size and equipment available
- However you plant, you MUST see seed on top of the ground when complete, or you planted too deep.
- NO deeper than ¼ inch



WHEN TO DO Checkout

- Can complete checkout the minute the seed is on the ground
- Does not have to be established before checkout
- The quicker you get out there after planting the better so you can get pictures of seed on top of the ground.



NEW SEEDING MANAGEMENT



YOUR NEW SEEDING
WILL LIKELY LOOK
ONE OF TWO WAYS...

NEW SEEDING MANAGEMENT



NO NEED TO WORRY
IN EITHER CASE!

NEW SEEDING MANAGEMENT



- Management leads to success!
- Can burn it the winter after the first year
- If burning is not an option, plan to high-mow multiple times during the first year to control competing vegetation.
- Research shows mowing as needed during the first growing season increased survival and abundance of new forb seedlings.

- Burning after the first growing season should be done in December or January.
- This will remove litter from annual grasses and forbs that came up the first year.
- Even with seemingly solid stands of ragweed/mares tail/foxtail, we have seen good second year recruitment of native plants. These plants provide mottled sunlight to reach the ground and can be a natural nurse crop. Burning off that residue can be important though.

NEW SEEDING MANAGEMENT



Site Prep



SecondYear



SecondYear



Third Year



Third Year



About **Five** Years in....



About **Five** Years in....



Long-term MANAGEMENT



- Once established, management practices are essential to maintain the forb community.
- Management should not occur before the 3rd growing season.
- Burning after the first year is maintenance for weed residue if needed.
- Develop a burn plan before burning.
- Control undesirable woody & invasive perennial plants
 - either by spot herbicide or proper timing of a burn

HOW DO WE PRODUCE Insects?

- Generalists make up only 10% of insect species, but a bulk of the biomass.
- Without insect species diversity we get this...



WE WANT TO PRODUCE balanced, DIVERSE COMMUNITIES OF INSECTS!



CIERA GARNER

- Up to 90% of all plant-eating insects are specialists, meaning they can only eat vegetation from plants they share an evolutionary history.
- i.e., If you want lots of insect species, you must have lots of plant species.



CIERA GARNER

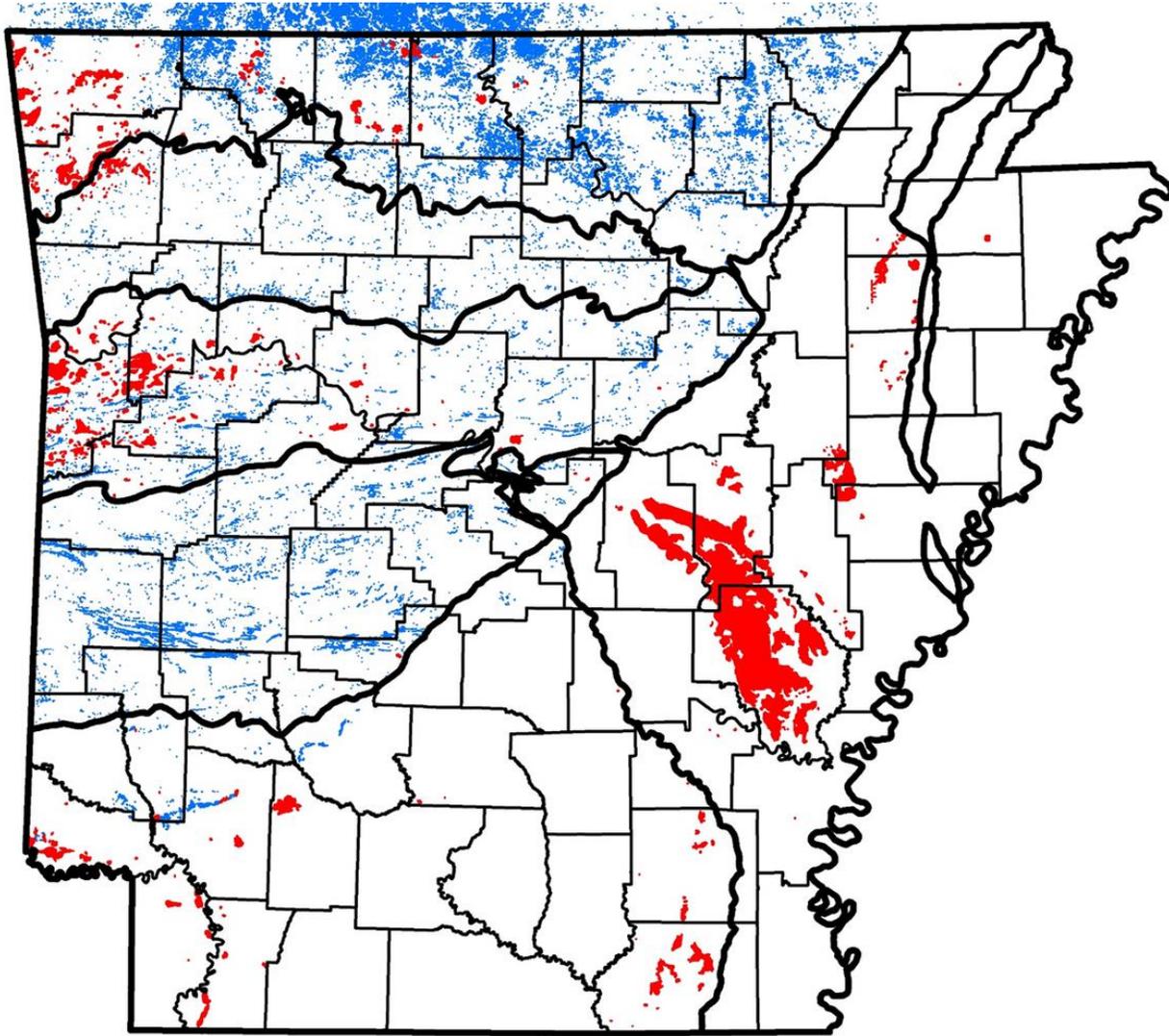
**TALLGRASS PRAIRIE ECOSYSTEM
CONTAINED SOME 40-60 SPECIES
OF GRASSES AND OVER 300
SPECIES OF FLOWERS!**



Arkansas

PRAIRIES & GLADES

- Prairies = Red
- Glades = Blue
- **Note: Woodlands and Savannas are not represented on this map.



Map data courtesy of the Arkansas
Natural Heritage Commission &
Paul Nelson/Central Hardwoods
Joint Venture

KEY MESSAGE:

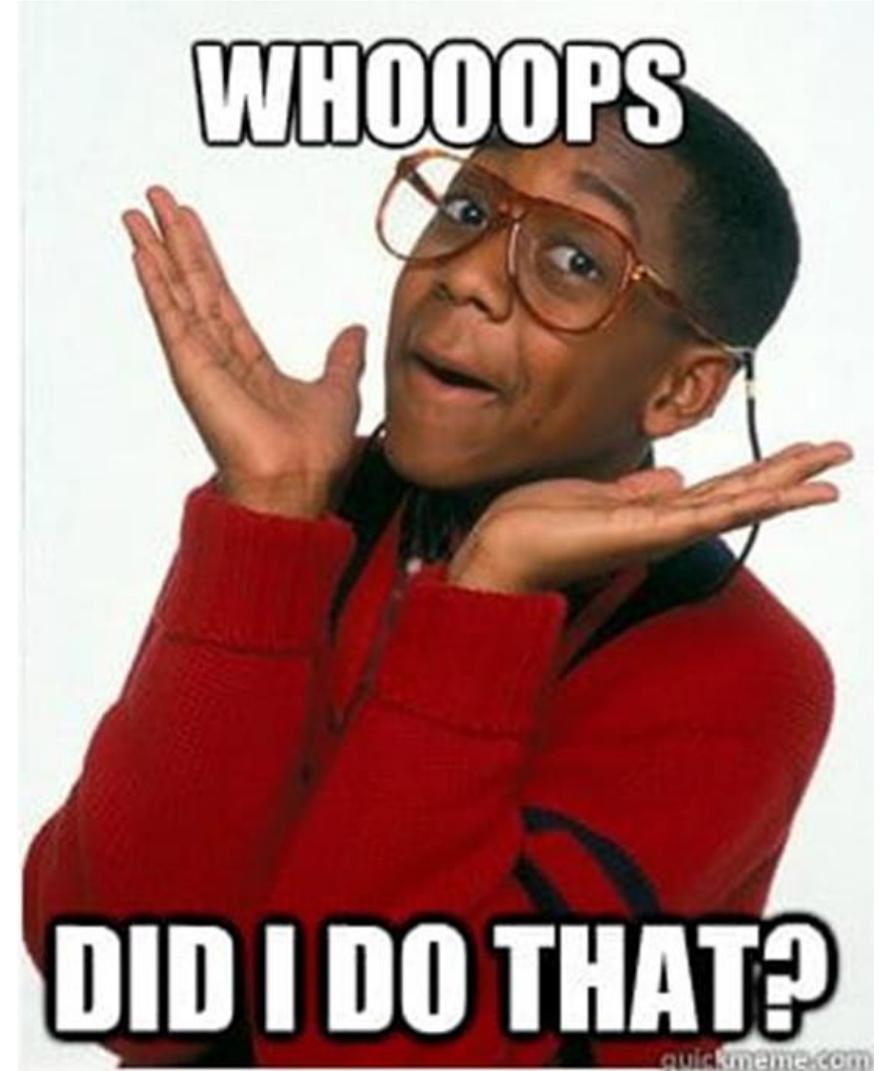
IF YOU WANT POLLINATORS...

IF YOU WANT QUAIL...

Grow Native!



**COMMON
MISTAKES
WITH
Pollinator
Establishme
nt**



Planting

TOO DEEP



- Maximum planting depth is less than $\frac{1}{4}$ inch. Optimum is most of it on top of the ground.
- If using no-till drill, must make sure it is calibrated correctly and not planted in soft soil.
- Remember, you must see seeds on top of the soil no matter how you plant.

Fertilizer

& LIME



- Additional N and P can be detrimental
- 420 DOES NOT need soil test

Being

IMPATIENT



- Expecting instant results. When they don't see it, they think it's a failed planting.
- Hammer home the "**Sleep, Creep, Leap**" saying to landowners.
- Manage their expectations before signing them up in a contract.
- If landowner followed directions and still thinks it's a failure, suggest a biologist go out and reassure them.

OTHER BENEFICIAL

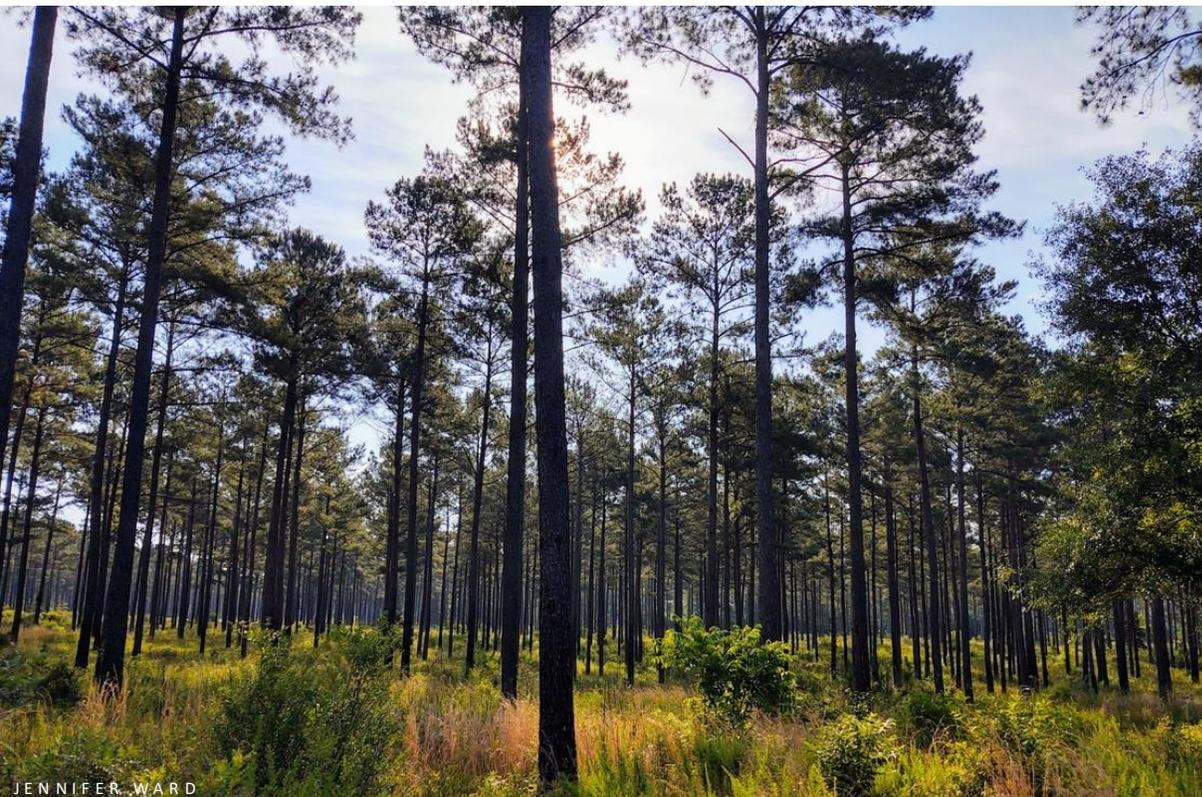
Practice S



Forest Stand Improvement (FSI)



JAKE MCCLAIN



JENNIFER WARD

- REDUCE CANOPY AND MIDSTORY
 - BA DEPENDS ON STAND
 - 50% CANOPY OPENING
- ALLOW SUNLIGHT TO REACH GROUND
- USE 666 OR 643 (SAVANNAH, WOODLAND, OR PRAIRIE RESTORATION)
- BURNING IS CRITICAL TO MAINTAINING
 - EVERY 2-3 YEARS
 - ALTERNATE SEASON

FSI Hardwoods



MORGAN MEADOR



MORGAN MEADOR

FSI in progress



Glade Restoration (643)



- USE 643 (RARE AND DECLINING HABITAT)
 - GLADE RESTORATION SCENARIO
- CUT CEDARS AND BURN
 - ONCE TO THE BROWN STAGE
- BURN SOME MORE....
- BURN AGAIN...
- KEEP BURNING!
- NO FIREBREAKS THROUGH GLADES!!!!

Prescribed Burning (338)



- REMOVES THATCH & LEAF LITTER
 - BARRIER FOR QUAIL MOVEMENT
 - INCREASES BARE GROUND
- SETS BACK WOODY VEGETATION
- STIMULATES NEW GROWTH
 - TIMING DICTATES SPECIES
 - DORMANT SEASON - GRASSES
 - LATE GROWING SEASON - FORBS & WOODY CONTROL
 - LUSH VEGETATION ATTRACTS LOTS OF INSECTS
 - ANNUAL PLANTS PRODUCE LOTS OF SEEDS
- BURN 1/3 TO 1/2 OF ACRES

Escape Cover Creation



PHEASANTS FOREVER & QUAIL FOREVER



- DOWNED TREE STRUCTURES
 - 30X50 FEET
 - DON'T PUSH THEM TIGHT LIKE A BURN PILE
 - 3 PER 5 ACRES OR 24 PER 40 ACRES
- EDGEFEATHERING
 - CHEMICALLY TREAT STUMPS OF UNDESIREABLE SPECIES

Escape Cover Creation



SAND HILL THICKET



XERCES SOCIETY

- PLANT SHRUBS
 - 3-12 FEET TALL SHRUBS
 - 30X50 FEET
 - 3X3 FOOT SPACING
 - CHICKASAW PLUM, FALSE INDIGO BUSH, ROUGHLEAF DOGWOOD, HAZELNUT, ELDERBERRY, AROMATIC SUMAC, WITCHHAZEL, SUMAC (IF NOT AGGRESSIVE IN THAT AREA)

Forage and Biomass - Natives (512)



- USE AT LEAST 3 SPECIES OF NATIVE GRASSES FOR THESE MIXES.
- PUT SOME FORBS THAT ARE PALATABLE TO CATTLE IN THERE AS WELL.
- SOME GRAZING MIXES ALREADY MADE. JUST ASK.

Resources at ArkansasMonarchs.org



- Be wary of “pollinator” or “wildflower” seed mixes!
- Always make sure species are native to Arkansas, preferably to your ecoregion.
 - BONAP
 - Lady Bird Johnson Wildflower Center
 - USDA PLANTS Database
 - Atlas of Vascular Plants of Arkansas (free pdf download)



Native Plant Care and Maintenance Guide for “Arkansas Native Plants List for Supporting Pollinators”

Native plants provide important habitat for pollinators, including butterflies, moths, bees, birds, flies, and beetles. Native wildlife co-evolved with native plants and rely on them for food, shelter, and as host plants for breeding. Once established, native plants require less maintenance. They are also adapted to the local climate and soils, so they require less water and no fertilizer.



This guide was curated by the Arkansas Monarch Conservation Partnership and is meant to complement the “Arkansas Native Plants List for Supporting Pollinators” to help Arkansans garden with native plants in more formal settings.

Native plants provide the most benefit to pollinators while improving soil health, increasing water infiltration, and supporting biodiversity.

General Native Plant Maintenance Tips:

- Native plants generally require less water than non-natives; however newly-planted plugs should be watered consistently during the first year to establish strong roots.
- Native plants generally require no artificial fertilization. They tend to become “leggy” and out-grow their natural support system when heavily fertilized.
 - In the home garden, consider segregating native plants away from non-natives that require heavy fertilization. If this is not possible, be prepared to use artificial support in some cases.
- When gardening for monarchs and other pollinators, do not apply any systemic or contact pesticides:
 - If insect control pesticides are not active plants (such as the entire land)
- When attracting caterpillars and other pollinators, the plants are cosmetic only can be stripped garden, you ca

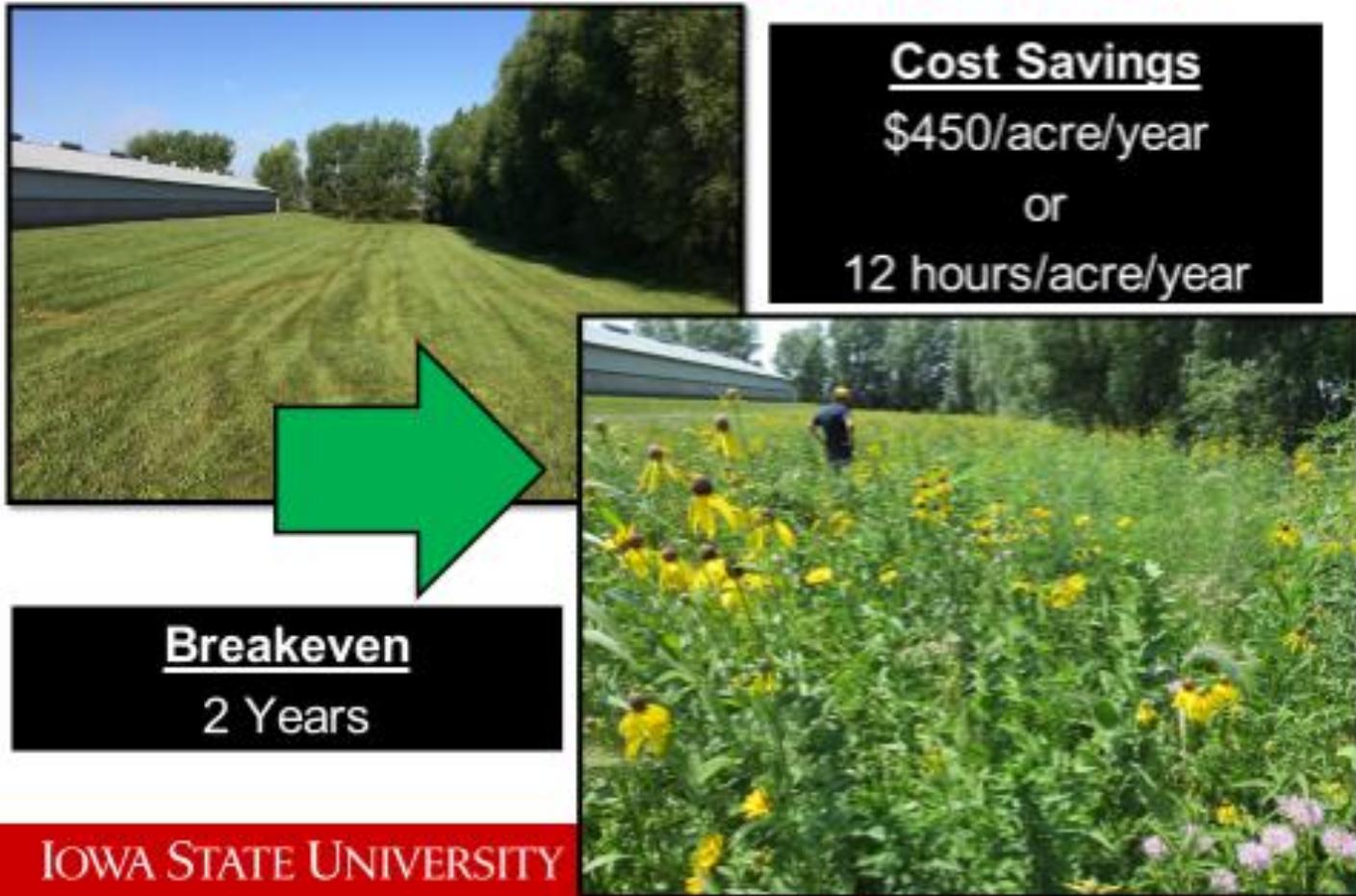
Arkansas Native Plants List for Supporting Monarchs

Scientific name	Common name	Bloom Period	Flower Color	Light Needs*	Water Needs*			
<i>Aesculus pavia</i>	red buckeye	Spring to Early Summer	red	sun to shade	M			
<i>Amorpha canescens</i>	leadplant	Summer to Fall	blue/purple	sun to light shade	L, M			
<i>Amsonia tabernaemontana</i>	Eastern bluestar	Spring	blue	sun to med. shade	M			
<i>Aristolochia tomentosa</i>	Dutchman's pipevine	Spring to Summer	yellow/green	part sun to shade	M, H			
<i>Asclepias incarnata</i>	swamp milkweed	Spring to Summer	pink	sun	L, M			
<i>Asclepias sullivanti</i>	prairie milkweed	Spring to Summer	rose/lavender	sun	M			
<i>Asclepias syriaca</i>	common milkweed	Early to Mid-Summer	lavender	sun to part shade	M	2-6	B, Bu, M	Vigorous spreader
<i>Asclepias tuberosa</i>	butterfly milkweed	Late Spring to Summer	orange	sun	L, M	1-2.5	B, Bu, M, H	Can bloom again in fall!
<i>Asclepias viridis</i>	antelopehorn milkweed	Spring to Summer	green/purple	sun	L, M	1-2	B, Bu	Spreads slowly
<i>Baptisia alba v. macrophylla</i>	white wild indigo	Summer	white	sun	M	2-3	B, Bu	
<i>Callirhoe involucrata</i>	wine cup	Early Spring to Summer	dark purple-red	sun	L	0.5-1.5	B, Bu	Drought tolerant once established
<i>Ceanothus americanus</i>	New Jersey tea	Spring to Summer	white	sun to light shade	L, M	3-4	B, Bu, H	Woody shrub
<i>Cephalanthus occidentalis</i>	buttonbush	Summer	white	sun to light shade	M, H	6-10	B, Bu, H	Woody shrub - good for rain gardens
<i>Cercis canadensis</i>	Eastern redbud	Spring	pink	sun to part shade	L, M	20-30	B, Bu	Small tree
<i>Conoclinium coelestinum</i>	blue mistflower	Summer to Fall	blue-purple	sun to part shade	M, H	1.5-2	B, Bu	Can spread vigorously
<i>Coreopsis lanceolata</i>	lanceleaf coreopsis	Spring to Summer	yellow	sun to part shade	L	2-3	B, Bu, M	May take 2 years to establish.
<i>Dalea purpurea</i>	purple prairie clover	Spring to Fall	lavender-purple	sun to part shade	L	1-3	B, Bu	
<i>Echinacea pallida</i>	pale purple coneflower	Summer	lavender	sun to part shade	L, M	2-3	B, Bu	
<i>Echinacea purpurea</i>	purple coneflower	Summer	purple	sun to part shade	L, M	2-5	B, Bu	
<i>Eryngium yuccifolium</i>	rattlesnake master	Summer	white	sun	M	2-5	B, Bu	Good pollinator plant
<i>Eupatorium perfoliatum</i>	Common boneset	Late Summer to Fall	white	sun	M, H	4-6	B, Bu	Important for fall migration
<i>Eutrochium purpureum</i>	Joe Pye Weed	Summer	pink-purple	sun to part shade	M, H	3-7	B, Bu	Good for rain gardens.
<i>Glandularia canadensis</i>	rose vervain	Spring to Summer	pink	sun	L	0.5-1.5	B, Bu	Poor and well-drained soil needed
<i>Helianthus angustifolius</i>	narrowleaf sunflower	Fall	yellow	sun	M	1	B, Bu	
<i>Helianthus divaricatus</i>	woodland sunflower	Summer	yellow	part shade to shade	L, M	2-6	B, Bu	may form colony
<i>Liatris aspera</i>	tall blazing star	Summer to Fall	purple	sun	L, M	2-3	B, Bu, H	Excellent nectar plant for butterflies!



Case Study for Conversion

Lawn to Pollinator Habitat Transitions



Cost Savings
\$450/acre/year
or
12 hours/acre/year

Breakeven
2 Years

IOWA STATE UNIVERSITY

Slide courtesy of Seth Appelgate

Articles

Financial Analysis of Converting Rural Lawns to Pollinator Habitat in the Corn Belt

Adam K. Janke,* John C. Tyndall, Steven P. Bradbury

A.K. Janke, J.C. Tyndall, S.P. Bradbury

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Abstract

Conservation efforts in rural landscapes seek to improve the multifunctional nature of land uses for people and the biotic communities that support them. In these environments, existing turfgrass lawns mowed routinely through the summer present an opportunity where changes in management from intensively managed monocultures to diverse native perennial vegetation can stack environmental benefits by improving soil health, water quality, and wildlife habitat. Conversion of lawns to pollinator habitat can help achieve continental goals of reversing declines in high-profile species such as the monarch butterfly *Danaus plexippus* and native bees. Here, we examine the financial implications for landowners and managers considering conversion of lawns to pollinator habitat in rural landscapes. We examined financial factors over a 10-y management horizon in three unique scenarios with a range of expenses: self-maintenance of lawns, contracted maintenance of lawns, and establishment and management of pollinator habitat. Our analyses indicate conversion to pollinator habitat was appreciably less expensive (\$54–\$167·acre⁻¹·y⁻¹) than continued self-care (\$637–\$1,007·acre⁻¹·y⁻¹) or contracted care (\$326–\$1,034·acre⁻¹·y⁻¹) of lawns over a 10-y period. These results establish the financial benefits for landowners or land managers considering an alternative management paradigm of existing lawns. These financial benefits complement existing literature, demonstrating multiple ecological benefits of diverse native perennial vegetation.

Keywords: Corn Belt; financial analysis; monarch butterfly; mowing; pollinator habitat; prairie; turfgrass lawns

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Citation: Janke AK, Tyndall JC, Bradbury SP. 2021. Financial analysis of converting rural lawns to pollinator habitat in the Corn Belt. *Journal of Fish and Wildlife Management* 12(1):151–162; e1944-687X. <https://doi.org/10.3996/JFWM-20-075>

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The findings and conclusions in this article are those of the author(s) and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

* Corresponding author: ajanke@iastate.edu

Introduction

Extensive changes in midwestern agricultural landscapes are leading to a reduction in their capacity to support biological diversity. Production practices in row cropped areas reduce diversity of crops grown in rotation, consolidate livestock production, and increase the use of genetically engineered crops to manage weeds and insect pests that, in total, promote uniform stands of crops (Krapu et al. 2004; Hartzler 2010; Brown and Schulte 2011; Pleasants and Oberhauser 2013).

Pasturelands managed as monocultures of introduced forage grasses or native warm season grasses suitable for grazing or haying typically do not include a diversity of forbs. These crop- and grass-dominated landscapes provide limited nectar and pollen forage to support honeybees, native bees, or other pollinators (Naug 2009; Goulson et al. 2015). In nonagricultural components of the landscape, such as field edges, drainage areas, roadside ditches, and grassed industrial, home, and farmstead areas, homogenization of the plant communities manifests via a combination of invasive

Native Pollinator Garden

Using BONAP



Introduction

The Biota of North America Program (or BONAP) is a great tool that can help you determine if a species is native to your [ecoregion](#) in Arkansas. There are several ways to use BONAP, so you can decide which method you personally prefer. We will guide you through two options.

If you prefer to look up a particular species, try the, "[Taxonomic Data Center Query \(TDC-Q\) Page](#)". If you prefer to search by genus to see all the species distribution maps at once, try the, "[North American Plant Atlas \(NAPA\)](#)" using the US County Maps listed alphabetically by genus.

Using Natives in your Garden

There are some controversies on how "strict" one should be with determining what native plants to include in a garden setting. Our general recommendation to make it easy for people just getting started with native plant gardening is to just stick with using plants that are native to the state of Arkansas, specifically when those species are used in a garden setting. If you'd like to only use ecoregionally-appropriate species, then just use BONAP to help you determine this.

If you are doing a larger restoration project (i.e. really anything larger than a normal garden), only use Arkansas natives that are specifically native to the ecoregion in which the project is located.

in Partnership can connect you to create an ecoregion seed mix.

Species - TDC-Q Page

We recommend bookmarking this page into the yellow box in the "Favorites" section of your browser. Species you'd like to view (Images)



Image 2: Type the genus or the species or subspecies level distribution map app



Native Plant Vendors

for small habitat projects

This list was curated with the purpose of helping Arkansans working on small native habitat projects find plant materials. Depending on the size of the project, it may be more cost-effective to purchase seed to grow your own plants than to purchase plugs (i.e. small plants).

If you are a landowner seeking native seed for a "pocket prairie" or large scale habitat planting, please consult your local Arkansas Game and Fish Commission Private Lands Biologist or Quail Forever Farm Bill Biologist for free technical assistance for regionally-appropriate native seed mix and vendor list.

Arkansas Plugs

- Grand Prairie Nursery**
 - Based in Central Arkansas, this grower can be contacted via email or through their Facebook page. Frequently sells at Hillcrest Farmers Market.
- Native Sun Nursery**
 - Open seasonally and located in White Hall, can email for appointment: nativesunnursery@outlook.com
- Pine Ridge Gardens**
 - Only brick and mortar native plant vendor in the state and based in London. See website for details.
- Ozark Native Plants**
 - Based in Madison County, this vendor lists native plant sale events in NW Arkansas on their website. You can email them to have specific plants brought to a sale.
- Ozark Soul Native Plants**
 - Based in south-central MO, this supplier does attend native plant sales in NW Arkansas. Plants are available for pre-order on their website.

Don't Dig Plants From The Wild!

It may be tempting to dig native plants from roadsides, prairie remnants, and other wild places, but doing so without permission is not only illegal, it also has adverse effects on the pollinators and other wildlife that rely on those plants for food and shelter.

Native plants have extensive and often deep root systems, and most will not survive being transplanted from their natural habitat.

Instead of digging, purchase plants from reputable vendors who grow plants from ethically-sourced seed and leave wild plants where they belong so they can continue to support wildlife.



No Grow Top 20 List & Native Alternatives

Invasive species are aggressive, non-native species that establish on many sites, grow rapidly, and spread to the point of disrupting native plant communities and ecosystems. Unfortunately, many of these invasives are readily commercially available and commonly used in landscaping because they're considered attractive. Do not be fooled by their "beauty"! Invasive species pose the greatest threat to our natural areas and native plant communities.

The native alternatives suggested on this document were selected with the idea that people were selecting an invasive species for a particular aesthetic or purpose. Please keep in mind there are many other Arkansas native plants that could also be selected.

INVASIVES No Grow

1. Tree-of-heaven (*Ailanthus altissima*)

Native Alternatives Good To Grow!

- Kentucky coffeetree (*Gymnocladus dioica*)
- Kentucky yellowwood (*Cladrastis kentuckeae*)

- Fringetree
- Honey locust
- Northern white cedar

- Common buckeye
- Cottonwood
- Flowering dogwood
- Spicebush
- Blackberry
- Southern magnolia

Arkansas



Recommended Reading List

Getting Started

1. Bringing Nature Home - Dr. Douglas Tallamy
2. Nature's Best Hope - Dr. Douglas Tallamy
3. Attracting Birds, Butterflies, and Other Backyard Wildlife - David Mizewski
4. Gardening for Butterflies - The Xerces Society



Digging Deeper

1. The Bees in Your Backyard - Joseph S. Wilson & Olivia Messinger Carril
2. Arkansas Butterflies and Moths - Lori A. Spencer
3. Pollinators of Native Plants - Heather Holm
4. A Guide for Eastern North America Wasps - Heather Holm



Field Guides & Reference Books

1. Common Bees of Eastern North America - Olivia Messinger Carril & Joseph S. Wilson
2. Arkansas Wildflowers - Don Kurz
3. Trees, Shrubs, and Woody Vines of Arkansas - Jennifer Ogle, Theo Witsell & Johnnie Gentry

Free Online Resources

1. [Bee Basics: An Introduction to Our Native Bees](#) - Beatriz Moisset, Ph.D. and Stephen Buchmann, Ph.D.
2. [Bumble Bees of the Eastern United States](#) - Sheila Colla, Leif Richardson, & Paul Williams
3. [Bee Identification Guide](#) - EPRI, Pollinator Power Party, & Pollinator Partnership



Native Pollinator Garden

Milk Jug Propagation Method



Some hurdles that new native plant gardeners encounter are availability and cost of live plants. Seeds are much cheaper than live plants, so starting seeds can let you plant a lot more without breaking your budget. This section highlights an easy way to propagate native plants from seed using "the milk jug method."

Many native wildflower species have seed that require several weeks or even months of **cold moist stratification** to germinate, which replicates what they would experience over the winter in the wild. Winter sowing (in jugs or in the ground) is an easy way to give seeds what they need to germinate without having to deal with refrigeration, a greenhouse, grow lights, and the hardening off process. Starting seeds in jugs in the winter is a fun indoor gardening activity people can do in January.

Pros

- A cost-effective way to plant more native plants.
- Protects the seeds from wildlife and competing plants, so you should get a better success rate than with planting seeds directly outside.
- Makes it easy to monitor the seedlings.
- Avoid stratifying seed in the refrigerator.

Materials Required

1. 1-gallon semi-transparent plastic jug (rinsed clean)
2. Seeds (collected or purchased)
3. Soil (with no added fertilizer)
4. Clear packing tape
5. Permanent marker
6. Scissors



Instructions



1. Punch 4 to 5 holes in the bottom of the jug for drainage.



2. Cut around the jug horizontally, just below the handle, making sure to leave a 1- to 2-inch "hinge" uncut so the top doesn't come completely off.

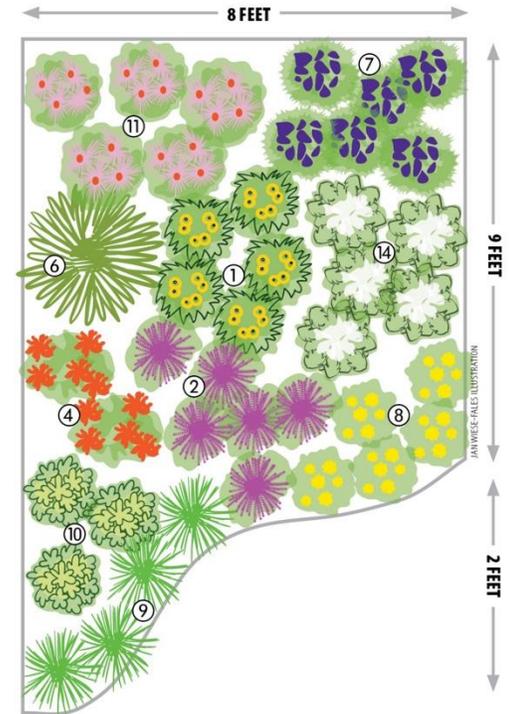
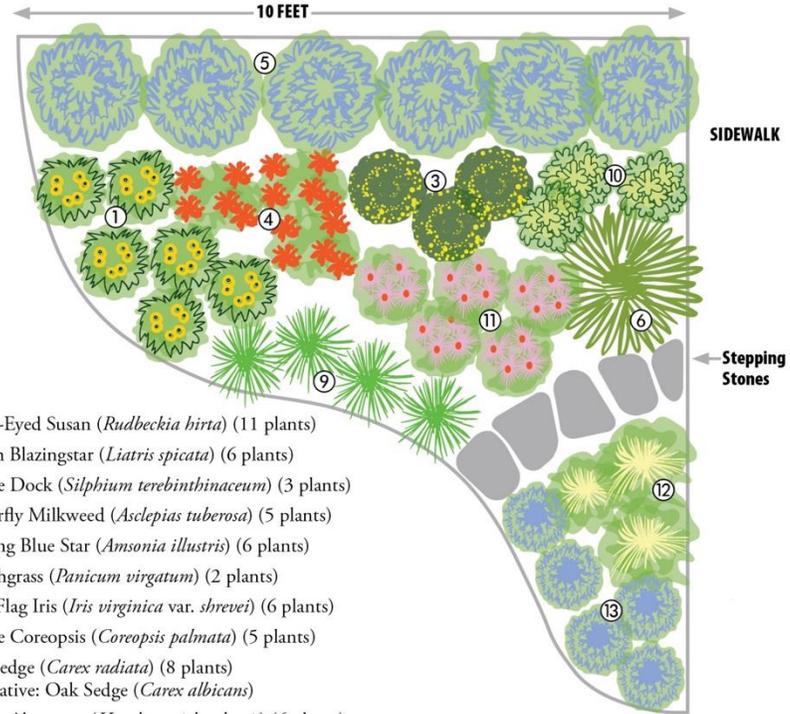
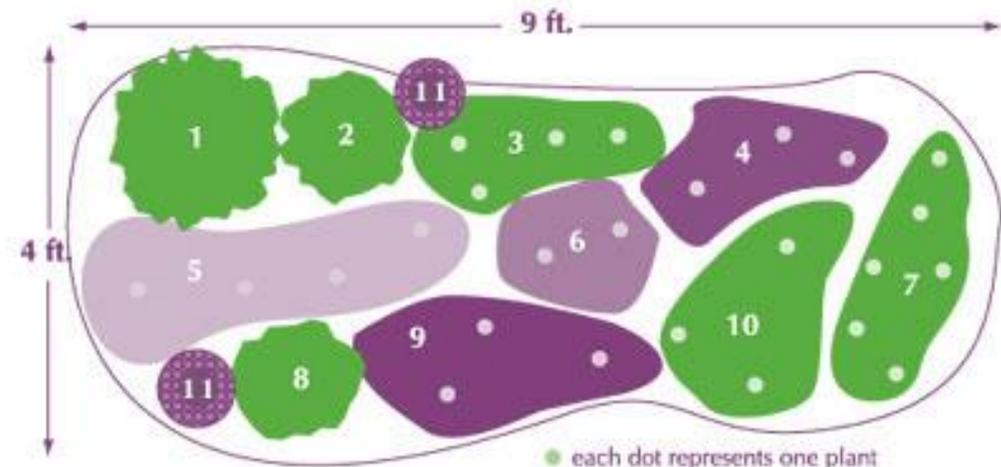


3. Flip open the hinged top. Fill the bottom with soil. It should be deep enough to leave plenty of room for the roots to grow.

Landscape Plans



NATIVE GARDEN DESIGN: FRONT YARD FORMAL FULL SUN



- ① Black-Eyed Susan (*Rudbeckia hirta*) (11 plants)
- ② Marsh Blazingstar (*Liatris spicata*) (6 plants)
- ③ Prairie Dock (*Silphium terebinthinaceum*) (3 plants)
- ④ Butterfly Milkweed (*Asclepias tuberosa*) (5 plants)
- ⑤ Shining Blue Star (*Amsonia illustris*) (6 plants)
- ⑥ Switchgrass (*Panicum virgatum*) (2 plants)
- ⑦ Blue Flag Iris (*Iris virginica* var. *shrevei*) (6 plants)
- ⑧ Prairie Coreopsis (*Coreopsis palmata*) (5 plants)
- ⑨ Star Sedge (*Carex radiata*) (8 plants)
alternative: Oak Sedge (*Carex albicans*)
- ⑩ Prairie Alumroot (*Heuchera richardsonii*) (6 plants)
- ⑪ Purple Coneflower (*Echinacea purpurea*) (1 plant)
- ⑫ Yellow Wild Indigo (*Baptisia sphaerocarpa*) (3 plants)
alternative: Blue Wild Indigo (*Baptisia australis*)
- ⑬ Feathery Blue Star (*Amsonia ciliata*) (5 plants)
- ⑭ Slender Mountain Mint (*Pycnanthemum tenuifolium*) (5 plants)

**ALL OF THE PLANS WILL BENEFIT POLLINATORS
REGARDLESS OF NAME**



This native garden design was produced by the Missouri Prairie Foundation's Grow Native! program from a design concept by Scott Woodbury, Shaw Nature Reserve. Partial funding for this garden design provided by Missouri Department of Conservation.

Missouri Prairie Foundation's Grow Native! website
www.grownative.org

Community Science

- iNaturalist
 - Upload photos of native bees
 - Join the Arkansas Monarch Mapping Project
- Journey North
- Get more information on our website:
ArkansasMonarchs.org



**APOIDEA
OF
ARKANSAS:
DOCUMENTING
NATIVE BEES
IN THE
NATURAL STATE**

Apoidea of Arkansas: Native Bees

About

Discover and document the species abundance and distribution of all native bee species in Arkansas.

[Read More >](#)

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[Your M](#)

[Proje](#)

Overview

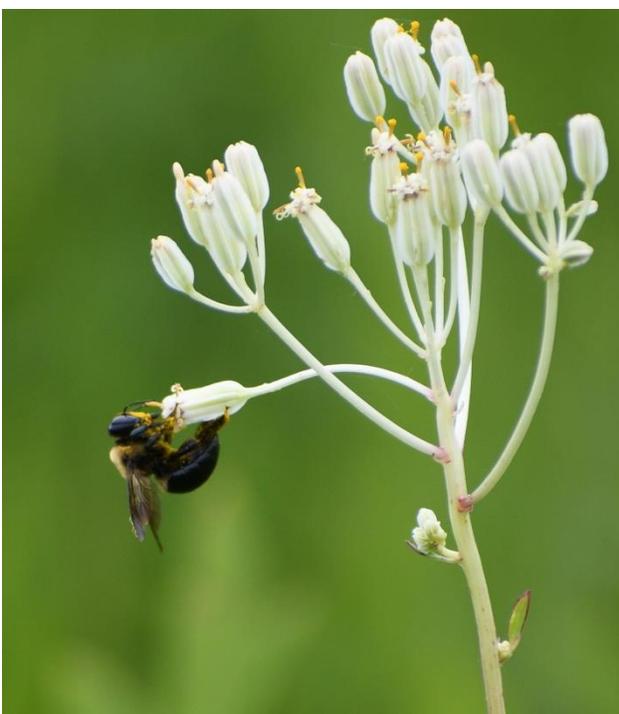
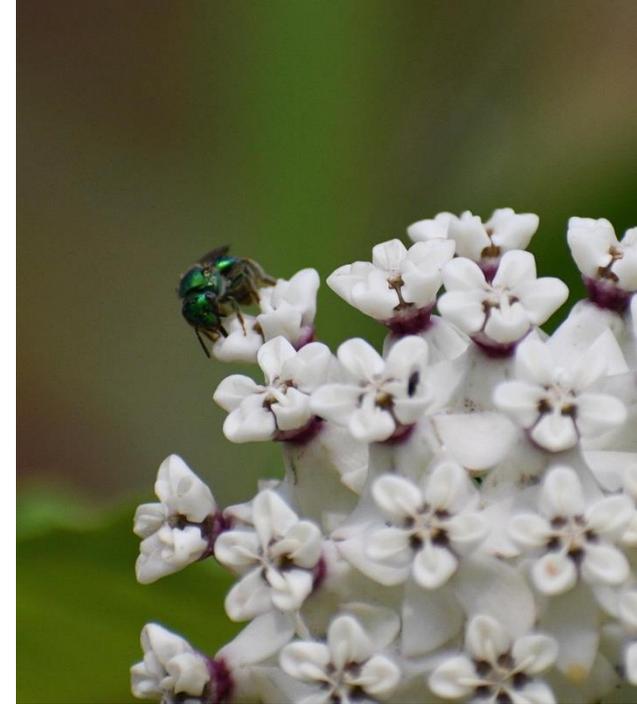
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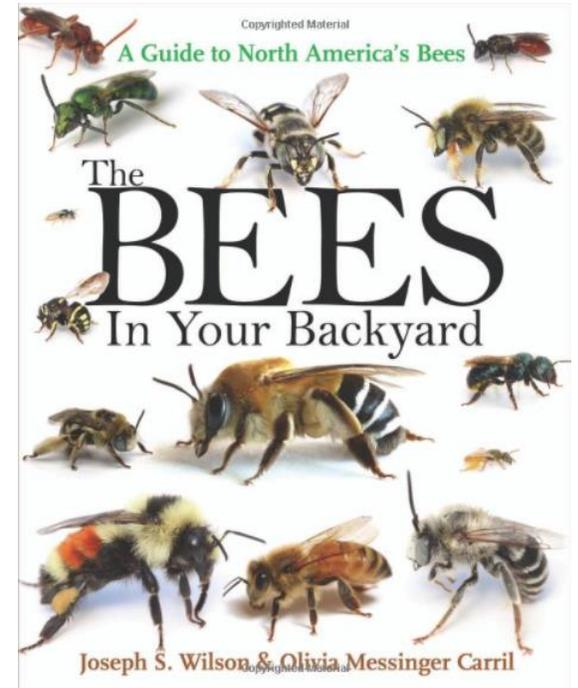
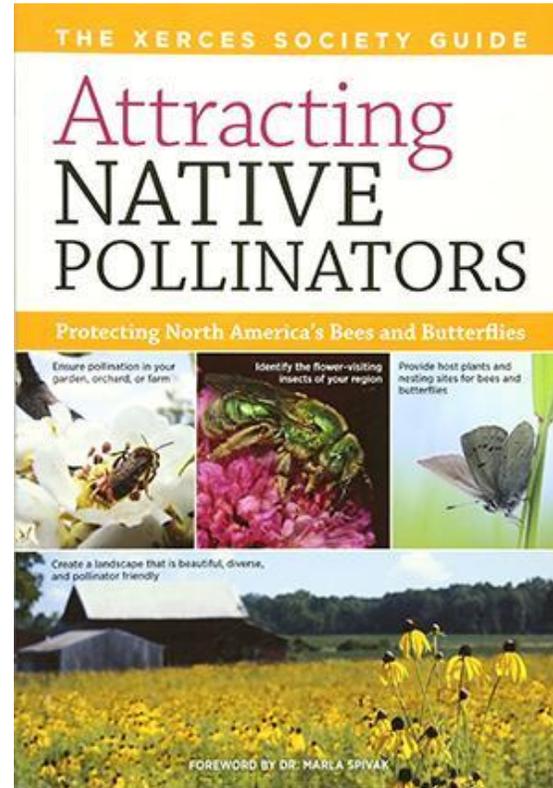
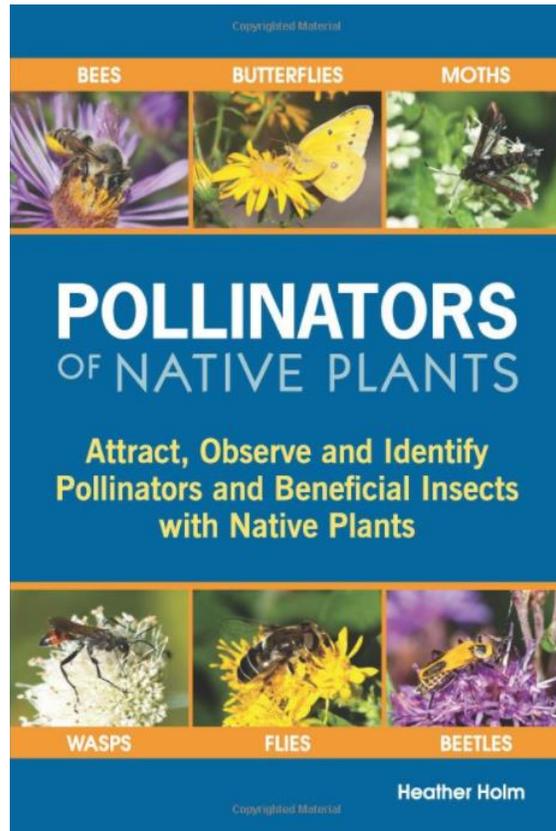
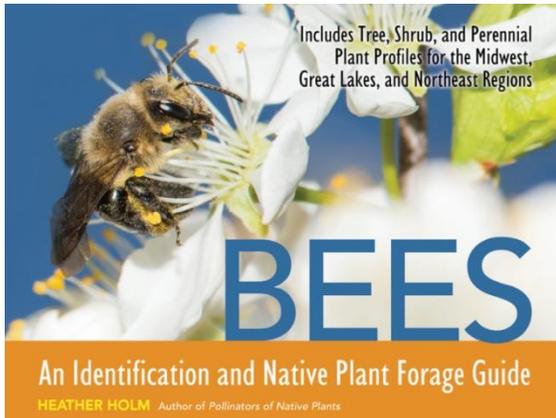
373
OBSERVERS

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Native Bee Monitoring

- AGFC
- ANHC
- NWACC
- Quail Forever
- UCA



Some Recommended Reads



ARKANSAS

Butterflies and Moths

SECOND EDITION

Lori A. Spencer



Don R. Simons
Principal Photographer

With a Foreword by Robert Michael Pyle

Copyrighted Material
"If you have a backyard, this book is for you."

-Richard Louv, author of *Last Child in the Woods*

Bringing Nature Home

UPDATED AND EXPANDED

**How You Can
Sustain Wildlife
with Native Plants**

Douglas W. Tallamy

Foreword by Rick Darke

Copyrighted Material

"Tallamy is one of the most original and persuasive
present-day authors on conservation."

-EDWARD D. WILSON, University Research
Professor Emeritus, Harvard University

NATURE'S BEST HOPE

A New Approach
to Conservation That
Starts in Your Yard

DOUGLAS W. TALLAMY

bestselling author of *Bringing Nature Home*

A photograph of a field of wildflowers. In the foreground, a pink flower with long, thin petals is in focus. The background is filled with green grass and other wildflowers, including white daisies. Two people are visible in the distance, one in a brown jacket and one in a dark jacket, walking through the field. The sky is clear and blue.

If you're a landowner interested in learning more about **cost-share programs** or receiving **free technical assistance** contact your local NRCS Field Office, QF Farm Bill Biologist, ADA Forester, or email me.

QF Farm Bill Biologists

- Help landowners utilize federal and state cost-share programs to high-quality habitat for monarchs and pollinators
- Provide free technical assistance
- Write free management plans

- AGFC Private Lands Biologists





1. **Plant** a diversity of Arkansas native plants to guarantee a constant supply of nectar and pollen from March through November.
2. **Remove invasive species** from your property so you're not contributing to the problem
3. **Consider all aspects of habitat** (foraging, nesting, and overwintering habitat).
4. **Don't spray insecticides.** Will kill pollinators in addition to the target species.

Native Species Lists

These species lists were taken from the *Arkansas NRCS Pollinator Conservation Planning Handbook*. Download the full pdf [here](#) or from the Field Office Technical Guide (FOTG): [https://efotg.sc.egov.usda.gov/api/CPSFile/30741/20-002_01_AR-NRCS-Poll-Handbook_web_\(printer-friendly\)](https://efotg.sc.egov.usda.gov/api/CPSFile/30741/20-002_01_AR-NRCS-Poll-Handbook_web_(printer-friendly))

The following tables include native plants that are important components of natural communities in Arkansas. The full native species lists include some species that may not be widely commercially available, or not available every year. The species list found here is not a full list of species found in Arkansas, and other species may be used. Please consult with specialists to determine if species are native to and appropriate for conservation plantings in Arkansas. See *Appendix C: Seed Mixes* in the handbook for regional seed mixes that include only commercially available species.

When planning field borders, filter strips, insectaries, nectar corridors, bee pastures, riparian buffers, hedgerows, windbreaks, alley crops, waterways, or any plantings to enhance habitat for pollinators and natural enemies (predators and parasitoids) of crop pests, include as many flowering species as possible. Pollinator plantings include species with overlapping bloom periods appropriate for site conditions (soil type, light regimes, moisture requirements, pH) and landowner goals. Native plantings rarely require fertilization (fertilizers tend to benefit non-native species more). Transplants (containerized or bareroot) may require supplemental irrigation for establishment.

Establishment of a full (adequately dense) perennial planting generally takes three years but will persist indefinitely if managed well. For the most part, only perennial plants are included in the species lists (Tables B1 to B6). Annual and biennial plants do provide food and other resources for pollinators but are often already present in the seedbank or surrounding landscape. Annuals and biennials are included in seed mixes to aid in establishment and provide benefit during initial years. The establishment of permanent habitat consisting of perennials is more cost effective and provides greater benefit over a longer period of time.

Plant Table Notes and Definitions

Plant Family

Plants within the same family have common characteristics and often support similar groups of insects and other wildlife.

Bloom Period(s)

BLOOM PERIODS*		
MONTH	TREES & SHRUBS	FORBS
February through March	Very Early Season	Early Season†
April through May	Early Season	
May through July	Mid-Season	Mid-Season
July through Sept (or later)	Late Season	Late Season

* Note that there is overlap in bloom period ranges since blooms may vary from north to south and each year.

† For habitat planning purposes, Very Early and Early count as a single blooming period for herbaceous plantings.

Flower Color

Describes the primary color(s) of standard blossoms: white [Wh]; cream [Cr]; yellow [Ye]; pink [Pk]; red [Rd]; maroon [Ma]; orange [Or]; purple [Pr]; violet [Vi]; lavender [La]; green [Gr]; blue [Bl]; brown [Br]

Height at Maturity

This indicates the potential height the plant will reach upon maturing and may vary depending upon local site conditions such as soil fertility, sunlight, climate, etc.

Shade Tolerance

Describes the relative tolerance for this plant to grow in shade conditions.

- Intolerant: will not tolerate shaded conditions
- Intermediate: will tolerate partially shaded conditions
- Tolerant: will tolerate full shade and usually does not prefer full sun

pH Range

This range indicates the minimum and maximum soil pH, of the top 12" of soil, within the plant's known geographical range. Soil pH is a measure of the acidity or alkalinity of the soil. Common ranges are: acid 5.6–6.0, slightly acid 6.1–6.5, neutral 6.6–7.3, and slightly alkaline 7.4–7.8. For more details, see the Soil Quality Information Sheet on Soil Quality Indicators: pH www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052208.pdf



Questions?

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Arkansas Monarch and Pollinator Coordinator

LCooper@QuailForever.org



www.ArkansasMonarchs.org



@ArkansasMonarchs



Native Bees

Approximately 4,000 species of native bees in N. America

Native bees have special habitat requirements:

1. Foraging Habitat
2. Nesting Habitat
3. Overwintering Habitat



European Honey Bees (*Apis mellifera*)

- Important pollinators to agriculture
- Managed pollinators
- Can also forage on native plants
- Plight of the pollinators



Native Bees in Arkansas

- This collection represents approximately 200 species of native bees
- Arkansas likely has 400-650 species of bees



Photo Courtesy of Coleman Little.



Generalists vs Specialists

Solitary vs Social Bees

- More than 90% are solitary bees
 - Each female constructs and provisions her own nest without any help from other members of her species
 - Less aggressive than honey bees typically because they don't have a nest to defend
- Bumble bees are the best-known native social bees
 - 200+ species of sweat bees that sometimes nest socially

The Xerces Society Guide: Attracting Native Pollinators (Mader et al. 2011)

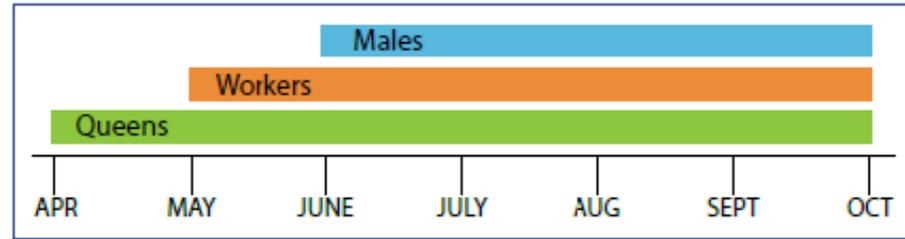


Bumble Bees

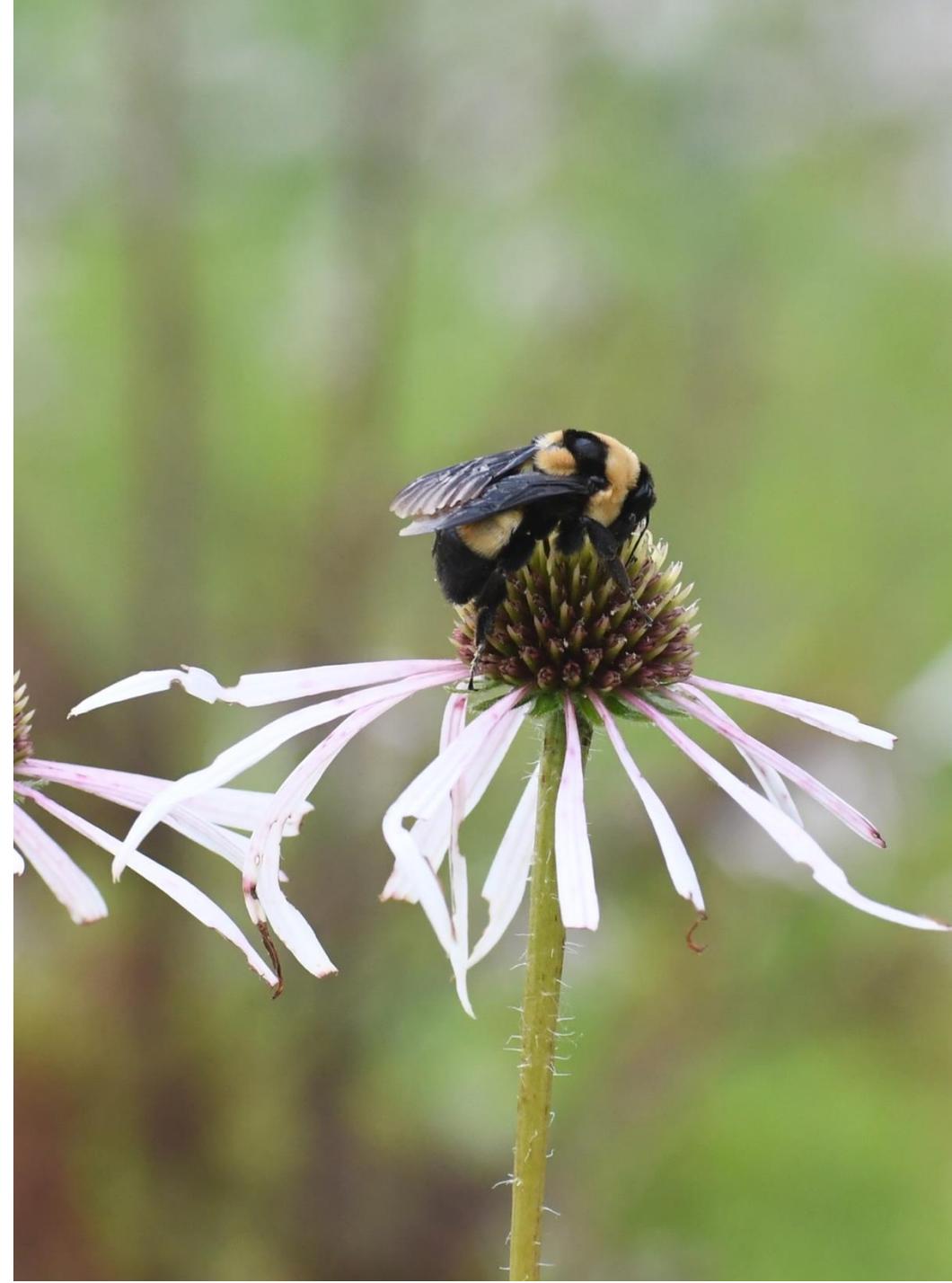
- 51 *Bombus* species in N. America
- Cavity-nesters
 - Tree cavity
 - Tussock of grass
 - Abandoned rodent nest
- Sonication or Buzz-Pollination
 - Crops like blueberries, tomatoes, potatoes, chili peppers, and eggplants



The Flight Seasons of the Bumble Bee



- Annual colonies
 - Typically <200 individuals but as many as 1,000
- Forages much closer to nest than honey bees
 - Depends on species
 - Typically no more than ½ mile; max. 1 mile
- Only new gynes overwinter
- Workers are produced first, then males are produced later in the season
- Gynes produced shortly after males
- Early- and late- blooming plants are particularly important



Ground-Nesting Bees

- About 70% of N. America's native bees (roughly 2,800 species) are solitary ground-nesters
- Dig in bare or sparsely vegetated soil, depending on species:
 - Varies from flat ground to vertical banks
 - Nest configurations range from a single short tunnel, to complex, branching tunnel systems





Wood- and Tunnel-Nesting Bees

- About 30% of N. America's native bees (around 1,200 species) are tunnel-nesters
- Many tunnel-nesting species use:
 - Abandoned beetle burrows in standing dead trees or limbs
 - Some chew out pith of dead, dry stems and twigs from such plants as elderberry and blackberry



Bee Houses

- Be wary of mass-produced bee houses
 - Not proper dimensions
 - May not be able to be properly sanitized
- Check Xerces Society website for these handouts:
 - “Tunnel Nests for Native Bees”
 - “Nests for Native Bees”

Remember, the key message always comes back to planting Arkansas Native Plants

INVERTEBRATE CONSERVATION FACT SHEET

Tunnel Nests for Native Bees

Nest Construction and Management

There are many simple and successful ways to make artificial nests for native bees. However, keeping the nests clean is important to limit disease build-up and maintain healthy bee populations.

About 30 percent of the four thousand species of bees native to North America nest in small tunnels such as hollow plant stems, abandoned horner-beetle holes in snags, and similar locations. This includes some of our best known native bees, the blue orchard bees and leafcutters. The absence of these features in intensively farmed landscapes can limit nesting opportunities for these important crop pollinators.

Artificial nests consisting of wood blocks drilled with a large number of dead-end tunnels have been promoted as a way to attract bees and boost their local populations. This can be an effective way to enhance bee populations but these nests do need some tending to maintain the benefits. This fact sheet provides an overview of tunnel-nesting bee biology, and guidance on how to make and manage nests.

TUNNEL-NESTING BEE BIOLOGY

The vast majority of native bee species, including tunnel-nesting bees, lead solitary lives. While they may have gregarious tendencies, preferring to nest near other members of their species, each female individually constructs her own nest and provisions it with food for her offspring.

To make a nest, a female bee builds partitions to divide the tunnel into a linear row of brood cells. Depending on the species, the partitioning walls may be constructed of mud, plant resins, leaf pieces, flower petals, and even cellophane-like glandular secretions.

The female provisions each brood cell with a mixture of pollen and nectar, onto which she lays a

Written by Eric Mader, Matthew Sheppard, Mace Vaughan, and Jessa Guise

The Xerces Society for Invertebrate Conservation
www.xerces.org



Pollinators are a vital part of a healthy environment. Native bees are North America's most important group of pollinators. Nest sites are simple to



Three types of home-made bee nests: (clockwise from left) wooden block, bamboo bundle, and bumble bee box.

Pollinators are a diverse and fascinating group of animals. In addition to their beauty, they provide an important link in our environment by moving pollen between plants and ensuring the growth of seeds and fruits. The work of pollinators touches every day through the food we eat. Even our seasons are marked by their bloom of springtime meadows, summer berry picking, pumpkins in the fall.

There are about 4,000 species of native bees in North America. Together they form the most important group of pollinators. Like all wildlife they are affected by changes in landscapes, especially the loss of nesting sites. Bees make nests in which they store pollen and provision brood cells for their offspring. In many modern landscapes, a lack of nesting sites has usually resulted in the removal of bare ground, dead trees, and tidy corners of rough grass—all important nesting sites for bees.

This fact sheet gives information on how to provide nest sites for native bees, including nest blocks and bare ground for solitary-nesting bees, and nesting boxes for bumble bees.

For more information, visit our web site, www.xerces.org, where you will find other fact sheets and more detailed guidelines on how to enhance habitat for pollinators. You also find information about *Attracting Native Pollinators*, *Protecting North America's Bees and Butterflies*.



Garden stuff

General Process

- **Site Prep** (kill existing vegetation)
 - Herbicide
 - Smothering
 - Sod Removal
- **Light and Soil Conditions**
 - Right plant, right place
- **Seed vs Plugs**
 - Plugs (costly, more organized)
 - Seed (cheaper, messier)
 - Propagation





Jonathan Young



Leslie Cooper

What Do I Plant?

- Maximize the species diversity for your area
 - Start with “the Rule of 3” – 3 species that bloom in each season (Spring, Summer, Fall)
 - Goal is to provide a succession of blooms to ensure constant supply of nectar and pollen
 - Early spring and late fall are particularly important
 - More plant diversity = greater bee diversity
- Put multiple plants clustered together
 - More aesthetically pleasing to neighbors
 - Easier to find = less energy for pollinators



Jonathan Young



Leslie Cooper

What Do I Plant?

- Minimum of 70% native plants, more is better!
 - Non-natives can provide some benefit, but just because it blooms doesn't mean it's good for bees
 - Know your natives
 - Don't plant invasive species
 - Landscapes with <70% native vegetation = "food deserts" and "habitat sinks" (Narango et al. 2018)

If you want to plant for pollinators,
plant native plants

Bee size correlates with foraging range

- The intertegular (IT) span, a measure of size, is correlated to the average foraging range of bees.
(Greenleaf et al. 2007)
- Take-home message: foraging habitat needs to be close to nesting habitat



Joseph Wilson



<https://umaine.edu/beemapper/landscape-ecology-wild-bees/>

Don't Forget Their Other Habitat Needs!

Bees need more than just flowers

- Leave the leaves
 - Natural mulch (weed control, moisture retention)
 - Caterpillars or pupae of Lepidoptera spp. may be in the leaves
- Reconsider how you mulch
 - Bare ground is important
 - Plant more plants
- "Plant" a log and leave the stubble
- Postpone garden clean-up
 - Temps consistently above 50 degrees during the daytime

Nesting & FOR POLLINATORS

STEPS TO CREATE NESTING & OVERWINTERING HABITAT:

- ✂ SAVE THE STEMS
- ✂ LEAVE THE LEAVES
- 👑 REDEFINE THE "PERFECT" LAWN
- 🐛 RE THINK HOW YOU USE MULCH
- 🌲 SAVE A SNAG AND "PLANT" A LOG
- 🌿 BUILD A BRUSH PILE
- 🪨 BUILD A ROCK PILE OR ROCK WALL
- 💧 PROVIDE A SAFE WATER SOURCE
- 📍 INSTALL A HABITAT SIGN

FIGURE 1: By selecting native plants and maintaining dead stems, you can provide high-quality overwintering habitat for pollinators and beneficial insects.

Moving Beyond Flowers

While flowering plants provide pollen and nectar, they also require suitable shelter for overwintering. Most bees and wasps create small nests within dead plant stems or cavities in the ground. Insects such as butterflies, wasps, and ground beetles seek shelter in dead stems and brush piles from predators and the elements, and to overwinter.

The More, The Better

The primary habitat features used by insects for shelter include stem stubble, shrubs, and wildflowers; leaf litter; ground; dead wood; brush piles; and logs. Incorporating as many of these features as possible into your landscape (rather than "cleaning" it up) and supporting a diversity of bees and other beneficial insects is the best way to create a diverse and resilient habitat.

Why Natural Is Best

The availability of nesting and overwintering sites is one of the most important factors in supporting native bees and other beneficial insects. Natural habitats provide a wide variety of nesting and overwintering sites, including dead stems, brush piles, and logs.

How to Create Habitat for Stem-nesting Bees



WINTER

Leave dead flower stalks intact over the winter.

SPRING

Cut back dead flower stalks leaving stem stubble of varying height, 8 to 24 inches, to provide nest cavities.



Female bees find cut or naturally-occurring open stems, start a nest, then lay an egg on the pollen balls. Larvae eat the pollen.

SUMMER

New growth of the perennial hides the stem stubble.



Bee larvae develop in cut dead stems during the growing season.

FALL

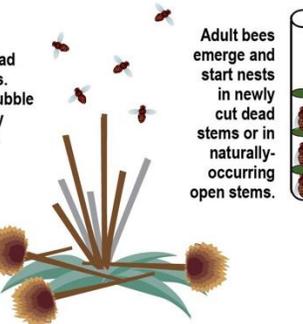
WINTER



Bees hibernate in stems during the winter.

SPRING

Cut back dead flower stalks. Old stem stubble will naturally decompose.



Adult bees emerge and start nests in newly cut dead stems or in naturally-occurring open stems.



Provide high-quality overwintering habitat for pollinators and beneficial insects.

By leaving enough natural resources in your landscape, you can provide habitat for a wide variety of pollinators and beneficial insects. This guide focuses on garden habitat features that can be readily incorporated into existing landscapes. Compared to artificial bee blocks and bee hotels, natural habitats often better mimic the natural environment and also break down naturally with time, reducing parasite issues. Moreover, natural habitats provide multiple conservation benefits, including increased wildflower planting, for example, which provides pollen and nectar for bees; host plants for butterflies; and abundant nesting sites for bees.

The **Bring Back the Pollinators** campaign is based on four principles: support native and pollinator-friendly flowers; create nesting sites and caterpillar host plants; avoid or reduce the use of insecticides; and support local beekeepers.

Join the campaign and support our pollinators.

[brp.org](http://www.bbrp.org)



Certified Gardens

- Certified Wildlife Habitat
 - National Wildlife Federation/ Arkansas Wildlife Federation
- Certified Native Habitat
 - Wild Ones | wildones.org
- Monarch Waystation
 - Monarch Watch
- Bird-Friendly Yard
 - Arkansas Audubon Society
- Arkansas Wild Spaces
 - Central AR Master Naturalists
 - Jefferson, Lonoke, Pulaski, and Saline counties
- GreenBridges
 - The Herb Society of America
- Monarch Joint Venture & the Xerces Society also have signs



Expectations



Where To Get Plants?

- AMCP Native Plant Vendor List
- DON'T DIG UP PLANTS
- Recurring Plant Sales
 - Check Arkansas Native Plant Society and Ozark Wild Ones facebook

This list was curated with the purpose of helping Arkansans working on small native habitat projects find plant materials. Depending on the size of the project, it may be more cost-effective to purchase seed to grow your own plants than to purchase plugs (i.e. small plants). If you are a landowner seeking native seed for a "pocket prairie" or large scale habitat planting, please consult your local Arkansas Game and Fish Commission Private Lands Biologist or Quail Forever Farm Bill Biologist for free technical assistance for regionally-appropriate native seed mix and vendor list.

- Arkansas Plugs**
1. [Grand Prairie Nursery](#)
 - a. Based in Central Arkansas, this grower can be contacted via email or through their Facebook page. Frequently sells at Hillcrest Farmers Market.
 2. [Native Sun Nursery](#)
 - a. Open seasonally and located in White Hall, can email for appointment: nativesunnursery@outlook.com
 3. [Pine Ridge Gardens](#)
 - a. Only brick and mortar native plant vendor in the state and based in London. See website for details.
 4. [Ozark Native Plants](#)
 - a. Based in Madison County, this vendor lists native plant sale events in NW Arkansas on their website. You can email them to have specific plants brought to a sale.
 5. [Ozark Soul Native Plants](#)
 - a. Based in south-central MO, this supplier does attend native plant sales in NW Arkansas. Plants are available for pre-order on their website.

Don't Dig Plants From The Wild!

It may be tempting to dig native plants from roadsides, prairie remnants, and other wild places, but doing so without permission is not only illegal, it also has adverse effects on the pollinators and other wildlife that rely on those plants for food and shelter.

Native plants have extensive and often deep root systems, and most will not survive being transplanted from their natural habitat.

Instead of digging, purchase plants from reputable vendors who grow plants from ethically-sourced seed and leave wild plants where they belong so they can continue to support wildlife.



Where To Get Plants?

Single Species Seed Packets

- Hamilton Native Outpost (MO)
- Missouri Wildflowers Nursery
- Prairie Moon Nursery (MN)
- Pure Air Natives (MO)
- Roundstone Native Seed (KY)
 - Click on “view product” under each species to see the packet option



Native Pollinator Garden Milk Jug Propagation Method



Some hurdles that new native plant gardeners encounter are availability and cost of live plants. Seeds are much cheaper than live plants, so starting seeds can let you plant a lot more without breaking your budget. This section highlights an easy way to propagate native plants from seed using “the milk jug method.”

Many native wildflower species have seed that require several weeks or even months of **cold moist stratification** to germinate, which replicates what they would experience over the winter in the wild. Winter sowing (in jugs or in the ground) is an easy way to give seeds what they need to germinate without having to deal with refrigeration, a greenhouse, grow lights, and the hardening off process. Starting seeds in jugs in the winter is a fun indoor gardening activity people can do in January.

Pros

- A cost-effective way to plant more native plants.
- Protects the seeds from wildlife and competing plants, so you should get a better success rate than with planting seeds directly outside.
- Makes it easy to monitor the seedlings.
- Avoid stratifying seed in the refrigerator.

Materials Required

1. 1-gallon semi-transparent plastic jug (rinsed clean)
2. Seeds (collected or purchased)
3. Soil (with no added fertilizer)
4. Clear packing tape
5. Permanent marker
6. Scissors



Instructions



1. Punch 4 to 5 holes in the bottom of the jug for drainage.



2. Cut around the jug horizontally, just below the handle, making sure to leave a 1- to 2-inch “hinge” uncut so the top doesn’t come completely off.



3. Flip open the hinged top. Fill the bottom with soil. It should be deep enough to leave plenty of room for the roots to grow.