



THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION



United States Department of Agriculture
Natural Resources Conservation Service



MONARCH
JOINT VENTURE

Pollinator Plants of the Central United States

Native Milkweeds

(*Asclepias* spp.)



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The Xerces Society for
Invertebrate Conservation

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We thank the photographers who generously allowed use of their images. Copyright of all photographs remains with the photographers.

Cover main: Butterfly milkweed (*Asclepias tuberosa*) with black and gold bumble bee (*Bombus auricomus*). Sarah Foltz Jordan, The Xerces Society

Cover bottom left: Monarch caterpillar (*Danaus plexippus*). William M. Ciesla, Forest Health Management International, Bugwood.org

Cover bottom right: Green antelopehorn milkweed (*Asclepias viridis*). Marion Doss.

Map Credits

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The Xerces Society for Invertebrate Conservation

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Pollinator Plants of the Central United States

Native Milkweeds (*Asclepias* spp.)

Purpose

Milkweeds are native perennial wildflowers that support diverse invertebrate wildlife, including agricultural pollinators such as wild native bees and honey bees. This document describes the plants' value to wildlife, highlights NRCS conservation practices in which milkweeds can be included, provides an overview of milkweed establishment practices, and profiles numerous species that are commercially available and can be incorporated into seed mixes and planting plans. Milkweeds that have special conservation status are also profiled.

Introduction

Milkweeds (*Asclepias* spp.) occur in a diversity of plant communities in the central United States including prairies, meadows, glades, open woods, forest margins, wetlands, and riparian areas. Milkweeds are the required larval host plants for the monarch butterfly (*Danaus plexippus*), and support a tremendous range of pollinators and other insects with abundant, high quality nectar. Milkweed flower visitors include native bees, honey bees, butterflies, beetles, flies, and hummingbirds. Milkweeds are named for their milky sap, which contains latex and complex chemicals (cardenolides) that make the plants unpalatable to most animals. The plants have fleshy, pod-like fruits (follicles) that split when mature, releasing the seeds. White, fluffy hairs (the pappus), are attached to each seed. These hairs, also called coma, floss, or silk, facilitate wind dispersal of the seed.



The central United States.

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Photo: © iStockphoto.com/ImagesbyDebraLee

Milkweed seed dispersing from a mature pod.

Milkweeds have a variety of ethnobotanical uses. Native Americans used stem fibers to make string, rope, and cloth (Stevens 2001). Also, some tribes used common milkweed (*Asclepias syriaca*) sap to remove warts and to treat ringworm and bee stings (Stevens 2000). Butterfly milkweed (*A. tuberosa*) roots, called “pleurisy root” have many medicinal uses, such as relieving inflammation of the lungs (Stevens 2001). Pleurisy root is currently sold as an over-the-counter herbal medicine. During World War II, millions of pounds of milkweed floss were used to fill life preservers and other life-saving equipment (Berkman 1949). Milkweed floss is currently used as hypo-allergenic filling for pillows and comforters.

Milkweeds were historically common and highly diverse in the tallgrass prairies that once dominated the central United States. However, milkweeds and many other native plant species have been eradicated on a broad scale, with agricultural intensification and the widespread adoption of herbicide resistant crops as significant drivers of habitat loss (Brower et al. 2012; Pleasants and Oberhauser 2012; Wilcove et al. 1998). At present, five milkweed species that occur in the region are federally or state listed as threatened or endangered (PLANTS Database). Despite milkweeds' native status and value to the monarch butterfly and a diversity of other pollinators, they are sometimes perceived as weeds and are eradicated from agricultural fields, pastures, and roadsides. While some milkweed species colonize lightly disturbed areas, most require specific habitat conditions and with the exception of common milkweed, do not often occur in cultivated cropland.

The scope of this document covers the Lower Midwest and central United States: Nebraska, Iowa, the majority of Kansas, Missouri, and Illinois, and significant parts of Oklahoma and Arkansas (map at left). Thirty milkweed species occur within this region, which is characterized by the eastern Great Plains in the west, the Ozark Mountains in the central part of this region, and the tallgrass prairie and central Mississippi River valley in the east.

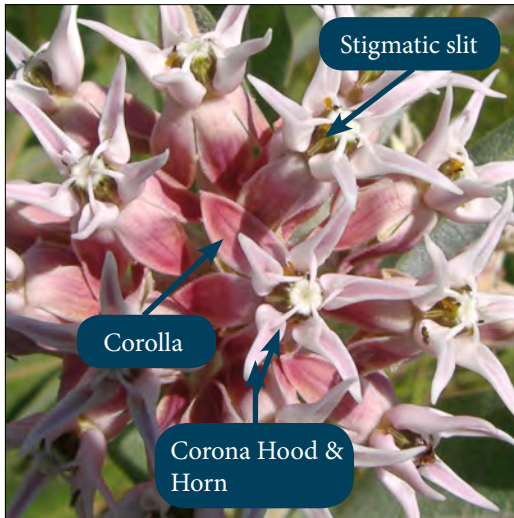


Photo: Eric Eldredge, USDA-NRCS.

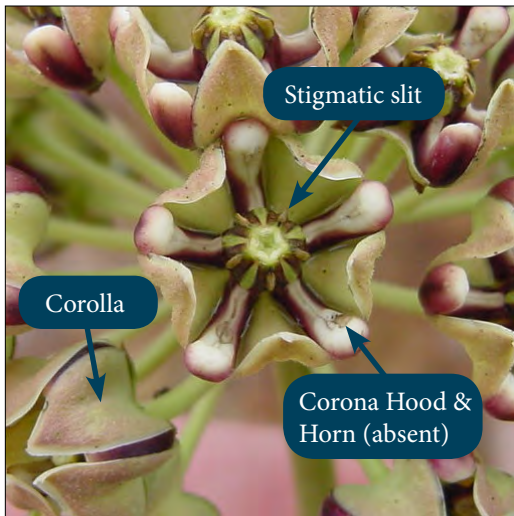


Photo: Linda Kennedy, National Audubon Society.

The structure of milkweed flowers remains consistent, despite one species appearing quite different from another. At the top is showy milkweed (*Asclepias speciosa*); at the bottom is antelope horns (*A. asperula*).

Toxicity to Livestock

The chemicals contained in milkweeds make them potentially toxic to livestock and other mammals. Milkweeds are distasteful to livestock (Kingsbury 1964) and animals do not usually eat them if sufficient forage is available (USDA ARS 2006). Most livestock losses result from hungry animals being concentrated in areas where milkweed is abundant (USDA ARS, 2006). Symptoms of poisoning include profound depression, weakness, labored breathing, and seizures (Burrows and Tyrl 2006). Poisoning may also occur if animals are fed hay containing large amounts of milkweed (USDA ARS, 2006); it is important to avoid the inclusion of milkweed in prepared feeds and hay. For more information about toxic dosage and signs of potential poisoning to livestock from consuming milkweeds, see Kingsbury (1964) and Burrows and Tyrl (2006).

Milkweed Pollination

Milkweed flowers have a unique shape and are pollinated in a more specific way than most other insect-visited flowers. Rather than occurring as individual pollen grains that cling to a flower visitor, milkweed pollen is contained in pairs of tiny, waxy sacs (pollinia), located in vertical grooves (stigmatic slits) of the flowers. When an insect visits a flower to sip nectar, its legs or mouthparts may slip into one of the grooves, thereby attaching pollinia to the insect. Pollination occurs when pollinia are inadvertently transferred by the insect into another milkweed flower. See Bookman, 1981, for a more complete discussion of milkweed floral morphology and terminology, and Morse, 1982, for more information on pollinia transfer by insects.

Monarch Butterflies

Milkweeds are the required host plants for monarch caterpillars. Female monarchs lay their eggs on milkweeds and once hatched, caterpillars feed on the plants for up to two weeks before forming chrysalises. Both caterpillars and adult butterflies store the plants' distasteful chemicals in their bodies, giving them some protection from predators.

Monarchs' annual migration in North America is a widely-known phenomenon. During spring, summer, and early fall, monarchs breed throughout the United States and southern Canada, and several generations of butterflies are produced each year. Butterflies of the last generation born in late summer or early fall migrate to either central Mexico or the California coast to spend the winter congregated in forest habitats. Though exceptions have been documented, fall monarchs produced east of the Rocky Mountains typically migrate to Mexico, while monarchs produced west of the Rockies typically migrate to coastal California. Tens of millions of butterflies overwinter in Mexico, whereas hundreds of thousands overwinter in California. In late winter and early spring, monarchs depart from overwintering sites in search of milkweeds on which to lay their eggs, thus starting the annual cycle again.

Unfortunately, the future of the monarch migration is at risk. Annual monitoring of overwintering monarchs has revealed significant population declines. For example, over the last 19 years, the average forested area occupied by monarchs in central Mexico was 6.69 hectares (16.53 acres). From 2004–2013, the estimated occupied area has been below average each year, with the 2012–2013 population being 1.19 ha (2.94 ac), the smallest estimated since comprehensive monitoring began in 1994 (Rendón-Salinas and Tavera-Alonso 2013). In addition to severe weather and forest degradation in the overwintering areas, a major factor contributing to these population declines is believed to be the loss of milkweed plants from the monarch's breeding range (Brower et al. 2012; Pleasants and Oberhauser 2012; Commission for Environmental Cooperation 2008).

The central United States is an important monarch breeding area and monarchs are typically present in the region throughout the spring and summer. In the mid-1990s, stable-isotope research showed that approximately 50% of the fall migrants arriving in Mexico were produced in the north central United States (Wassenaar and Hobson 1998). However, steep declines of milkweeds and monarchs have resulted from the widespread adoption of herbicide-resistant corn and soybean crops across the region. Prior to the introduction of these crop varieties that are genetically modified to tolerate application of glyphosate-based herbicides, common milkweed (*Asclepias syriaca*) was widespread along the margins of row crop fields. Between 1999 and 2009, Hartzler (2010) documented a 90% decline of common milkweed in Iowa corn and soybean fields. Pleasants and Oberhauser (2012) estimated a 58% decline of milkweed density in the Midwest land-

scope between 1999 and 2010, with a corresponding 81% decline in monarch production.

These documented declines in milkweed habitat and monarch breeding potential illustrate the urgent need to protect existing milkweed populations and also to increase the abundance of milkweeds through restoration activities.

Agricultural Pollinators

Native plants such as milkweeds play an important role in supporting both wild bees and honey bees. Wild native bees provide free pollination services, and contribute an estimated \$3 billion worth of crop pollination annually to the U.S. economy (Losey and Vaughan 2006). However, these resident pollinators are active in the field longer than the duration of a crop's bloom period, and require sources of pollen and nectar throughout spring, summer, and fall. Research has shown that managed honey bees are healthier and more resistant to diseases when they have access to diverse and abundant floral resources (Alaux et al. 2010). The International Bee Research Association classifies North American milkweeds as class 1/2 for honey production, reflecting a theoretical yield of up to 50 kilograms of honey produced per hectare of milkweed plants (i.e., if they occurred as a contiguous stand) (Ramsay 1987).

Supporting Beneficial Insects

In addition to attracting pollinators, milkweeds support insects that are natural predators and parasitoids of many crop

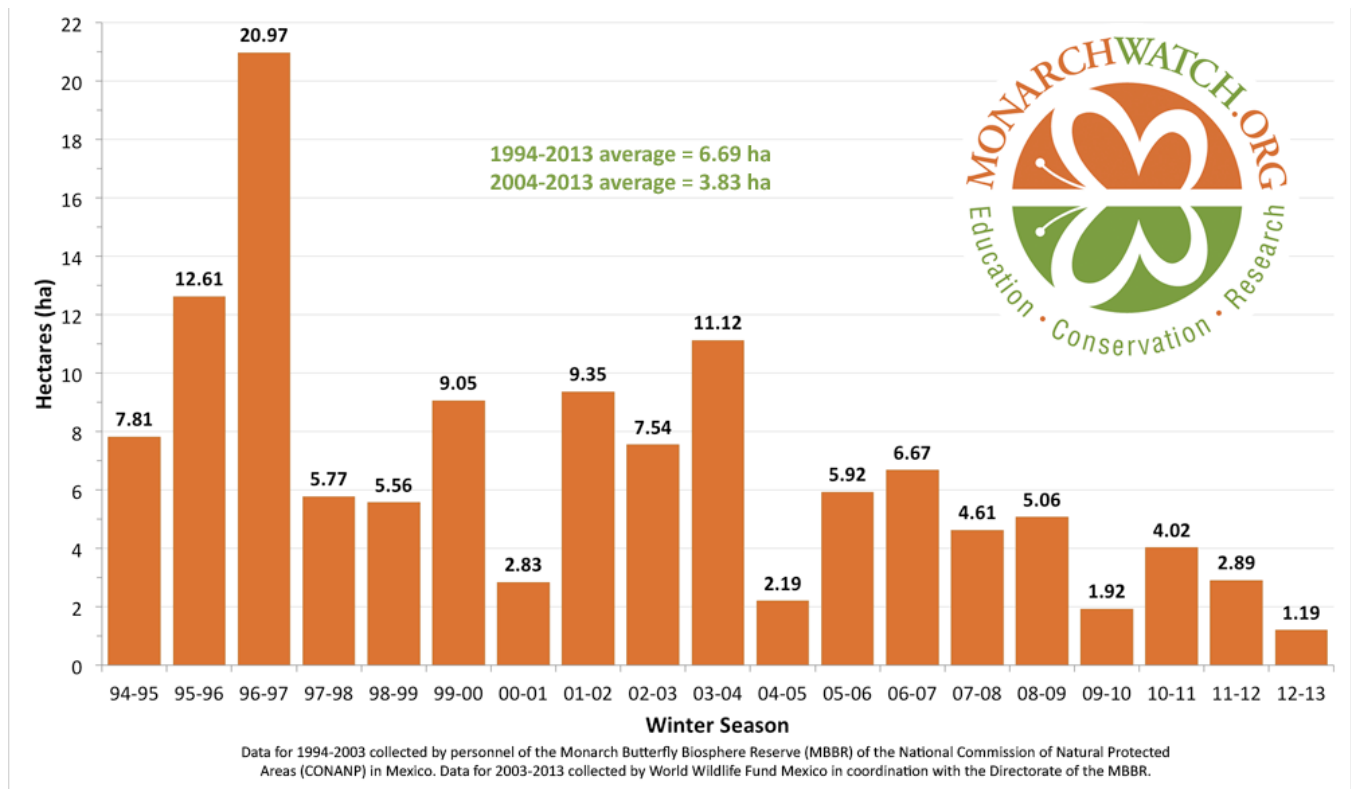
and garden pests. Many wasps, beetles, and flies, which are important groups of beneficial insects, have relatively short tongues and preferentially forage on flowers such as milkweeds that have easily accessible nectar (Mader et al. 2011).

A recent study conducted in Washington state evaluated 43 species of native flowering perennials for their potential to attract beneficial insects. Showy milkweed (*Asclepias speciosa*) attracted the most beneficial insects of any plant species studied, including mite-eating ladybeetles (*Stethorus* spp.), minute pirate bugs (*Orius* spp.), hover flies (Syrphidae), and parasitic wasps (Ichneumonidae, Braconidae) (David G. James, unpublished data). In Michigan, swamp milkweed (*Asclepias incarnata*) has been documented as very attractive to natural enemies of crop pests (Fiedler et al. 2007).

If similar studies of native plant attractiveness to beneficial insects are initiated in this region, it would be advantageous to include one or more milkweeds in the suite of species that are evaluated.

Milkweed Herbivores

In addition to monarch butterflies, insects that are specialized to feed on milkweed include seed bugs (*Lygaeus kalmii*, *Oncopeltus* spp.), longhorn beetles (*Tetraopes* spp.) that feed on foliage and roots, a stem weevil (*Rhysomatus lineaticollis*), the oleander aphid (*Aphis nerii*), and several additional species of Lepidoptera. These insects are host specific and are not a threat to agricultural crops.



Total area occupied by monarch colonies at overwintering sites in Mexico, between 1994 and 2013. Graph created by Monarch Watch.

Using Milkweeds in Pollinator Habitat Restoration

Incorporating Milkweeds into NRCS Conservation Practices

Beginning in 2008, the Farm Bill included language that makes pollinators and their habitat a priority for every USDA land manager and conservationist. For detailed information on how Farm Bill programs can be used to conserve and create habitat for pollinators, please consult the National Technical Note 78 (2008) “Using Farm Bill Programs for Pollinator Conservation”.

Many NRCS conservation practices can be used to create,

enhance, or manage habitat for pollinators and other beneficial insects. Including milkweeds in seed mixes and planting plans will provide both an important source of nectar from late spring through summer (depending on the species planted), and a larval food source for the monarch butterfly. The table below features examples of practices in which milkweeds can be included; it is not an exhaustive list. Each species in the table is profiled later in this document.

Conservation Practice	Code	Recommended Species	Notes
Channel Bank Vegetation	322	ASSP, ASSU, ASSY	Species adapted to moist soils can be included in plantings for both bank stabilization and wildlife value.
Conservation Cover	327	ASAS, ASHI, ASSP, ASSU, ASSY, ASVE, ASTU, ASVI2	Milkweeds are ideal for including in wildflower meadow plantings that are designed to provide habitat for bees.
Constructed Wetland	656	ASIN	Swamp milkweed is a wetland-adapted species that is common in the region.
Critical Area Planting	342	ASAS, ASVE	These species grow well on slopes and hillsides, and may be useful for soil stabilization.
Early Successional Habitat Development/Management	647	ASAS, ASHI, ASSP, ASSU, ASSY, ASVE, ASTU, ASVI2	Several milkweeds have good colonizing ability and thrive in open habitats with full sun exposure.
Field Border	386	ASAS, ASHI, ASSP, ASSU, ASSY, ASVE, ASTU, ASVI2	Field borders provide numerous conservation benefits beyond supporting pollinators. Use caution where spread by underground rhizomes is undesirable.
Hedgerow Planting	422	ASHI, ASSP, ASSU, ASSY, ASVE	Milkweeds can be incorporated into hedgerow edges, providing additional plant structure. Use caution where spread by underground rhizomes is undesirable.
Pest Management	595	ASAS, ASHI, ASSP, ASSU, ASSY, ASVE, ASTU, ASVI2	Some studies have shown that milkweed nectar is highly attractive to beneficial insects that prey upon or parasitize pest insects. Providing habitat for such insects has been demonstrated to be valuable for vineyards, orchards, and other crops.
Riparian Herbaceous Cover	390	ASSP, ASSU, ASSY	Species adapted to moist soils and high water tables can provide resources for monarchs and pollinators using riparian areas.
Streambank and Shoreline Protection	580	ASIN	Swamp milkweed can provide bank and shoreline protection as well as nectar for flower visitors.
Wetland Enhancement	659	ASIN	Where forb enhancement is desired, swamp milkweed can be included.
Wetland Restoration	657	ASIN	Swamp milkweed can be used when restoration plantings include a forb component.

Scientific and common names, with milkweed abbreviated as “mw”: ASAS: *A. asperula* (antelope horns); ASHI: *A. hirtella* (tall green mw); ASIN: *A. incarnata* (swamp mw); ASSP: *A. speciosa* (showy mw); ASSU: *A. sullivantii* (prairie mw); ASSY: *A. syriaca* (common mw); ASTU: *A. tuberosa* (butterfly mw); ASVE: *A. verticillata* (whorled mw); ASVI2: *A. viridis* (green antelopehorn).

Protecting Existing Milkweed Stands

Where milkweeds already occur, in remnant natural areas or non-cropped areas such as field borders, roadsides, and ditch banks, conservation practices that involve the management of existing habitat can protect the plants as a resource for monarch caterpillars, pollinators, and other beneficial insects. It is ideal to leave milkweeds undisturbed to the greatest extent

possible throughout the growing season, especially when they are flowering. Milkweeds can potentially host monarch caterpillars whenever the plants have foliage. If maintenance activities such as mowing, spraying, or burning must be conducted during the growing season, it is ideal to treat only a subset of the total area occupied by milkweed. Many of the species featured in the table below are profiled later in this document.

Conservation Practice	Code	Recommended Species	Notes
Restoration and Management of Rare and Declining Habitats	643	ASAM, ASAR, ASAS, ASEN, ASHI, ASIN, ASLA3, ASLA4, ASME, ASOV, ASPU2, ASSP, ASST, ASSU, ASSY, ASVE, ASTU, ASVI, ASVI2	Preventing tree and shrub encroachment, and controlling non-native grass invasion can maintain or enhance the habitat quality of remnant prairies in which numerous milkweeds potentially grow. The majority of milkweeds native to the region, including those with special conservation status, are associated with prairie communities.
Upland Wildlife Habitat Management	645	All species except for swamp milkweed, which is wetland-adapted.	Practices such as livestock grazing and controlling invasive plant species will promote native plant diversity, thus providing diverse resources for wildlife.
Wetland Wildlife Habitat Management	644	ASIN	Where applicable, eradicating invasive plant species will encourage native plant diversity. Minimizing or avoiding pesticide use will promote beneficial insect health.

Scientific and common names, with milkweed abbreviated as “mw”: ASAM: *A. amplexicaulis* (clasping mw); ASAR: *A. arenaria* (sand mw); ASAS: *A. asperula* (antelope horns); ASEN: *A. engelmanniana* (Engelmann’s mw); ASHI: *A. hirtella* (tall green mw); ASIN: *A. incarnata* (swamp mw); ASLA3: *A. lanuginosa* (sidecluster mw); ASLA4: *A. latifolia* (broadleaf mw); ASME: *A. meadii* (Mead’s mw); ASOV: *A. ovalifolia* (oval-leaf mw); ASPU2: *A. purpurascens* (purple mw); ASSP: *A. speciosa* (showy mw); ASST: *A. stenophylla* (slimleaf mw); ASSU: *A. sullivantii* (prairie mw); ASSY: *A. syriaca* (common mw); ASTU: *A. tuberosa* (butterfly mw); ASVE: *A. verticillata* (whorled mw); ASVI2: *A. viridis* (green antelopehorn); ASVI: *A. viridiflora* (green comet mw).

Milkweed Establishment

Milkweeds are most easily established from seed, and germination rates are typically high. Transplants (plugs) of some species are also commercially available. Milkweeds prefer full sun and most will tolerate dry soil conditions. Native milkweeds of this region are deciduous perennials. Following seed dispersal, they die back to the ground. They remain dormant during the winter, and re-emerge in the spring from established root systems. With the exception of prolonged drought, the plants will not require any supplemental watering.

Site Preparation and Seeding

Milkweed seed should ideally be planted in the fall. While some seed predation will occur, exposure to cold temperatures and moist conditions during winter will stimulate germination. Spring planting is also possible but artificial stratification of the seed is recommended to enhance germination. For planting areas several acres in size, milkweed can be included in native seed mixes and direct seeded to a depth of ¼–½ inch, using a specialty wildflower seed drill. Direct seeding requires good soil preparation; the seedbed should be a smooth, lightly packed surface, free of clumped sod and plant debris. For small sites, a rake or turf roller can be used to remove or break up large dirt clods. For large areas, the soil can be prepared with a cultipacker, spike tooth harrow, or similar tractor-drawn equipment. For planting areas of any size, seed can

also be broadcast onto a smooth, weed-free soil surface. To achieve good seed to soil contact, the seed can be compacted into the ground with a cultipacker, lawn roller, or the wheels of an ATV or tractor. To facilitate milkweed establishment, it is important to eradicate existing weed cover and deplete the amount of weed seeds in the soil seed bank. Depending on the abundance of weeds or weed seed at the planting site, one to two full years of weed control may be needed. Weeds can be controlled through tillage, herbicide application, flaming, smothering, or a combination of those methods. For more detailed information on site preparation and seeding, please consult the Job Sheet Installation Guide “Conservation Cover (327) for Pollinators, Upper Midwest” (<http://www.xerces.org/pollinator-conservation/agriculture/pollinator-habitat-installation-guides/>).

Seedling Propagation and Transplanting

When producing transplants from seed, sowing the seeds in a greenhouse during early February is recommended. Once seedlings have reached desirable size and vigor for transplanting, it is ideal to move them from the greenhouse to a shadehouse, to allow them to acclimate to outdoor environmental conditions for a few days before being transplanted into the field. Feedback from restoration specialists suggests that milkweed seedlings are intolerant

of root disturbance. Transplant shock can be minimized by propagating seedlings in biodegradable peat pots, which can be planted directly into the ground. Transplanting should only be done after the threat of frost has passed. Transplants will need to be watered regularly during the first growing season and weed control may be necessary. Mulching around the plants will help suppress weed growth and reduce water loss.

Seed Collection and Processing

Milkweed seed can be collected and cleaned by hand when small volumes are needed to create new habitat. It is advisable to avoid collecting pods on which milkweed bugs (*Lygaeus kalmii* and *Oncopeltus* spp.) are present, because their feeding activity renders seeds inviable. Mature milkweed pods split open along a vertical seam and seeds are brown when mature. It is ideal to collect pods when the seam has just begun to split, but before the pod has fully opened and the floss has expanded. When seed will be cleaned by hand, it is easiest to

separate the seeds from the floss at this stage. If pods do not open easily when gently squeezed, the seeds inside will not be mature. If it is not feasible to regularly check plants for pod maturation, mesh “seed capture bags” can be affixed over the maturing pods and to be retrieved at a later date. However, if seed will be cleaned by hand, this approach increases the amount of time and labor needed to separate seeds from floss.

Shop vacuums can be an effective tool for cleaning up to a few pounds of milkweed pods. As small handfuls of floss and seed are slowly fed into a vacuum, the lightweight floss fibers tend to aggregate around the filter while the seeds fall into the vacuum receptacle. Minimizing the amount of pod shells that enter the vacuum will result in a cleaner seed lot and reduce the need for further hand cleaning. Because there is considerable range in the design and horsepower of shop vacuums, it is advisable to conduct a small test run to ensure that seeds do not get broken.



Photo: Desert Botanical Garden

A seed capture bag made from lightweight polypropylene garden fabric (“floating row cover”) and affixed with a length of fine-gauge wire. Alternatively, mesh bags with drawstrings can be purchased from some companies that sell corn shoot bags.



Photo: Brianna Borders, The Xerces Society

In our experience, a 5.5 HP shop vacuum was very effective at separating seeds from floss. The floss fibers aggregated around the filter and could be easily removed, while the seeds accumulated in the vacuum receptacle (red canister at right).

Seed Sourcing

When using milkweeds in habitat restoration efforts, it is important to use wild-type plant materials that are as locally sourced as possible. While the genetic effects of cultivar selection are largely undocumented, plants bred for flower color traits may have lost some of their ability to produce nectar or may have altered chemical composition and therefore may not provide the same resources for wildlife as compared to wild-type plants. Though cultivars are suitable for planting in gardens or urban areas, it is best not to plant them in or near natural areas where they could breed with wild populations. Butterfly milkweed (e.g., ‘Hello Yellow’) and swamp milkweed (e.g., ‘Cinderella’ and ‘Ice Ballet’) are examples of milkweeds

for which selected cultivars are available.

Milkweed seed can be purchased on the internet from multiple vendors but given some species’ broad distribution across the United States, available seed may be of non-local origin. To identify sources of regionally appropriate seed, please ask prospective vendors for details about seed origin. An appendix to this document features a list of vendors that typically have milkweed seed in stock. Some of these vendors also sell milkweed transplants. Additionally, source-identified transplants can be ordered from Monarch Watch (www.monarchwatch.org; 888-824-4464).

Species Profiles

Commercially Available Species

Of the 30 milkweed species that occur in the region, nine are commercially available (to varying degrees) and can be utilized in restoration and revegetation efforts within their native ranges. These species are profiled in the following pages. Seed of butterfly, common, and swamp milkweed is reliably

available by the pound; these species are the most suitable for use in large-scale plantings. Seed of the other six species is often available by the ounce, though supplies may fluctuate from year-to-year. These species can be included in a variety of small-scale plantings.

Asclepias asperula ssp. capricornu Antelope horns



Photo: Nancy Lee Adamson, The Xerces Society



Photo: Native American Seed



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Upland prairie pastures and hillsides, grasslands, and roadside rights-of-way. Grows in many soil types including rocky limestone, gravel, sand, and clay.

Description: Plants are generally low-growing with multiple stems and sometimes form dense clumps. Corollas form a cup shape below the hoods of the flowers. Leaves are long and usually folded lengthwise. The species' common name is derived from the curved shape of its fruits. Antelope horns is more abundant in Texas (the southern part of its range) than in Oklahoma, Kansas, and Nebraska. Another subspecies, *asperula*, occurs in the western United States. Antelope horns is primarily a spring host plant for the monarch, but depending on summer rainfall received, the plants sometimes have foliage during the fall.

Flower color: Corolla light green, corona purple tipped with white

Bloom time: May – June

Maximum height: 3 feet

Estimated seeds per pound: 98,000

About the Species Profiles

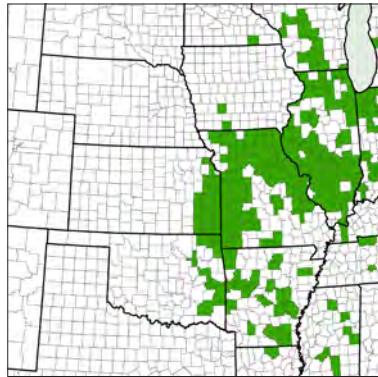
Habitat descriptions in these profiles are derived from University of Kansas herbarium records and numerous regional floras and field guides that are listed in the References and Additional Resources section. Information about bloom time and plant height is also sourced from regional floras and field guides. The range maps showing county-level distribution were created by the USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team,

using the latest data available from the PLANTS database. For additional details on species distribution, please consult regional floras. Data on seeds per pound is sourced from the Kew Botanic Gardens Seed Information Database and various seed companies (Cardno JFNew, Everwilde Farms, Prairie Moon Nursery, Roundstone Seed). When multiple data points were available, the figure shown represents an average.

Asclepias hirtella Tall green milkweed



Photo: Tom Barnes, University of Kentucky



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Description: Stems are stout. Leaves are long and narrow, mostly alternate, and hairy. There are typically multiple flower clusters per plant. Within the target region, this species is most abundant in Missouri.

Flower color: Corolla green, often tinged with purple; corona green, cream, or lavender

Bloom time: May – August

Maximum height: 3 feet

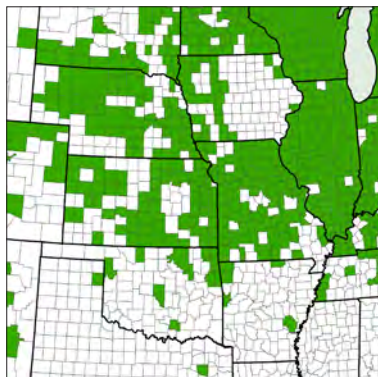
Estimated seeds per pound: 64,300

Habitat: Upland tallgrass prairie, lowland prairie, prairie hay meadows, glades, along roadsides, sometimes in marshy areas. Grows in rocky, sandy, or clay soils.

Asclepias incarnata ssp. *incarnata* Swamp milkweed



Photo: David Cappaert, Michigan State University, Bugwood.org



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Description: Swamp milkweed prefers wet to consistently moist soil, but has some tolerance for drier soil conditions. It can be incorporated into a variety of wetland enhancement and restoration projects. Stems are smooth and usually branched. Leaves are numerous, opposite, and narrow. Another subspecies, *pulchra*, occurs in Texas and several eastern states but not in the central United States. Swamp milkweed is frequently used by monarchs as a host plant.

Flower color: Corolla bright pink, corona light pink to white

Bloom time: June – September

Maximum height: 5 feet

Estimated seeds per pound: 86,800

Habitat: Wet areas of meadows and prairies, in sloughs and roadside ditches, along the borders of swamps, marshes, ponds, and lakes, along the edges of streams and rivers.



Photo: MJ Hatfield

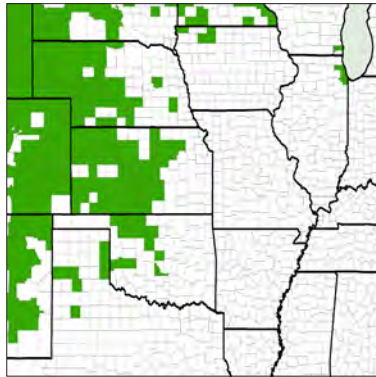
Asclepias speciosa Showy milkweed



Photo: MJ Hatfield



Photo: MJ Hatfield



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Moist sandy, loamy, or rocky soils of short grass prairies and roadsides and along rivers, streams, sloughs, ponds, and lake margins.

Description: Showy milkweed has the largest flowers of any milkweed. The hoods of the flowers are elongated and together form the shape of a 5-point star. Plants are tall with stout stems and large, broad leaves. Soft hairs cover both the stems and leaves. Showy milkweed is the most widespread, abundant milkweed in the western states. Its range extends into the central United States with numerous occurrences in Oklahoma, Kansas, and Nebraska. Showy milkweed and common milkweed have similar stature and where the species' ranges overlap, it may be difficult to distinguish them when plants are not flowering. The two species are closely related and they hybridize occasionally (Woodson 1954). Showy milkweed sometimes reproduces clonally, through the spreading of underground rhizomes.

Flower color: Corolla pink, corona pink or white

Bloom time: May – August

Maximum height: 4 feet

Estimated seeds per pound: 75,000

Asclepias sullivantii Prairie milkweed

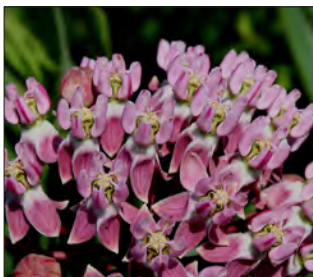
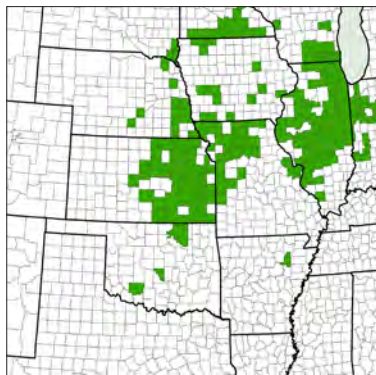


Photo: R.W. Smith, Lady Bird Johnson Wildflower Center



Photo: R.W. Smith, Lady Bird Johnson Wildflower Center



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Sandy, loamy, or rocky calcareous soils of lowland and upland prairies, wet meadows, creek banks, and river bottoms. Also grows along roadsides and railways.

Description: Plants are sturdy with thick stems. Leaves are opposite and broad and typically ascend at a pronounced angle. As compared to showy and common milkweed, this species' stems, leaves, and fruits are hairless. Prairie milkweed flowers are larger than those of common milkweed but smaller than showy milkweed flowers. This species reproduces clonally, through the spreading of underground rhizomes.

Flower color: Corolla and corona both medium pink, the corona usually of a lighter shade

Bloom time: June – August

Maximum height: 4 feet

Estimated seeds per pound: 84,500

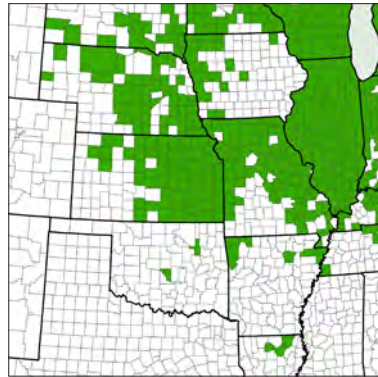
Asclepias syriaca Common milkweed



Photo: Mike Halverson



Photo: Steven Katovich, USDA Forest Service, Bugwood.org



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Prairies, old fields, and margins of woods, in the flood plains of lakes, ponds, or waterways, and along creek banks, roadsides, and railways. Grows in sandy, clay, or rocky calcareous soils.

Description: Plants are tall with stout stems and broad, thick leaves. Flowers are fragrant and are borne in multiple clusters per plant. Common milkweed spreads clonally, via underground rhizomes. Common milkweed is the most abundant milkweed in the midwestern and northeastern United States and the most frequently used host plant in the eastern monarch's breeding range. Laboratory analyses of monarch tissues have revealed that the majority of butterflies overwintering in Mexico fed on common milkweed as caterpillars (Malcolm et al. 1993; Seiber et al. 1986). The loss of this important host plant from agricultural fields in the Midwest is likely having a significant impact on monarch breeding potential in the region (Brower et al. 2012; Pleasants and Oberhauser 2012).

Flower color: Corolla and corona both a muted pink, the corona usually of a lighter shade.

Bloom time: May – August

Maximum height: 7 feet

Estimated seeds per pound: 61,700

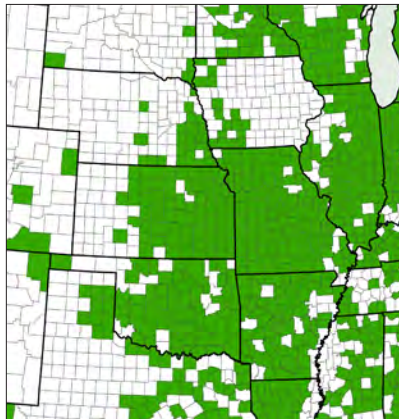
Asclepias tuberosa ssp. *interior* Butterfly milkweed



Photo: Mike Halverson



Photo: Allen Casey, Missouri NRCS



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat:

Well-drained sandy, loamy, or rocky soils in open woods, prairies, savannas, old fields, and along roadsides.

Description: Drought-tolerant, broadly adaptable, and one of the most common and

widely distributed milkweeds in the Ozarks, southern Great Plains, and the central Midwest. Another subspecies, *rolfsii*, occurs in the southeastern United States. It is the only milkweed species lacking the milky sap that is characteristic of the genus. Plants typically have multiple stems and often have a bushy appearance. Stems are covered in short, soft hairs. Leaves are also hairy, particularly on the undersides. Butterfly milkweed is an important source of nectar for many insects, but may be a sub-optimal larval host plant for monarchs. Though monarch caterpillars can complete their development on butterfly milkweed, anecdotal evidence and preliminary studies suggest that female monarchs do not prefer to lay eggs on the species (Chip Taylor, Monarch Watch, personal observations).

Flower color: Variable, ranging from yellow to orange to red. Most typically, the corolla and corona are both bright orange.

Bloom time: May – September

Maximum height: 3 feet

Estimated seeds per pound: 69,600

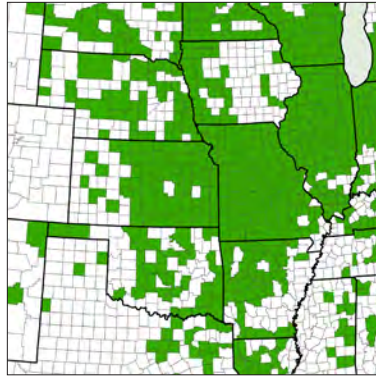
Asclepias verticillata Whorled milkweed



Photo: Chris Evans, Illinois Wildlife Action Plan, Bugwood.org



Photo: Chris Evans, Illinois Wildlife Action Plan, Bugwood.org



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Sandy, clayey, or rocky calcareous soils of prairies, glades, dry open woods, fields, flood plains, and hillsides.

Description: Plants are slender and the leaves are narrow, linear, and typically arranged in a whorled pattern around the stem. This species reproduces clonally, through the spreading of underground rhizomes. Whorled milkweed is one of the more toxic milkweed species; livestock managers should take appropriate measures to prevent animals from consuming the plants.

Flower color: Corolla white, green, or brown; corona white

Bloom time: June – September

Maximum height: 3 feet

Estimated seeds per pound: 182,000

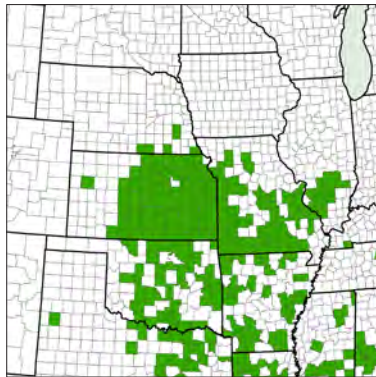
Asclepias viridis Green antelopehorn



Photo: Joseph A. Marcus, Lady Bird Johnson Wildflower Center



Photo: John D. Byrd, Mississippi State University, Bugwood.org



USDA NRCS PLANTS Database

Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Habitat: Sandy or rocky soil in prairies, glades, grasslands, and pastures, and along roadsides.

Description: Plants are generally low-growing and have multiple stems. Flowers closely resemble those of antelope horns (*A. asperula*), but the cup-shaped corollas of the flowers are much larger. Green antelopehorn is one of the main hosts for spring breeding monarchs in the south-central United States (Lynch and Martin 1993) and monarchs produced at southern latitudes play an important role in recolonizing the northern breeding range later in the season (Malcolm et al. 1993). Green antelopehorn is primarily a spring host plant, but sometimes re-emerges for a second growth cycle in response to prescribed burning during summer (Baum and Sharber 2012). Seed of this species is currently only available from a limited number of vendors.

Bloom time: May – August

Flower color: Corolla light green, corona purple tipped with white

Maximum height: 2 feet

Estimated seeds per pound: 68,500

Imperiled Species

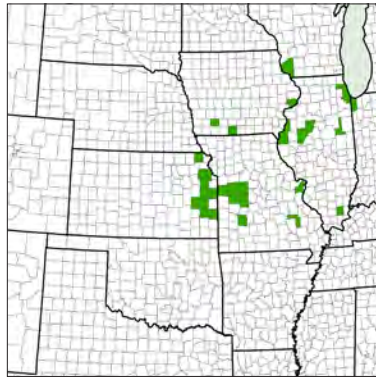
Mead's milkweed (*A. meadii*) has been federally listed as a threatened species since 1988. Four additional milkweeds that occur in the region are state listed as threatened or endangered. Where they are rare and declining, these species are in need of protection, habitat management, and targeted

restoration and recovery efforts. These milkweeds tend to have a narrower set of survival parameters than the more common species and may have more specific habitat requirements related to soil characteristics, moisture availability, and frequency of disturbance.

Asclepias meadii Mead's milkweed



Photo: Retha Meier, Saint Louis University



USDA NRCS Set PLANTS Database
in conjunction with the National Plant Data Team.

Current distribution: The species persists in small, scattered populations in Illinois, Iowa, Kansas, and Missouri, with nearly 91% of these populations located in 23 counties in eastern Kansas and west-central Missouri.

Conservation status: Federally threatened; endangered in Illinois, Iowa, and Missouri; S2 (imperiled) in Kansas.

Flower color: Corolla and corona green

Bloom time: May – June

History: Prior to European settlement, Mead's milkweed appears to have been widely distributed throughout the tallgrass prairie region, from Indiana to northeastern Kansas, and south into Missouri and Illinois.

Widespread fragmentation and destruction of tallgrass prairie resulted in the loss and decline of many Mead's milkweed populations.

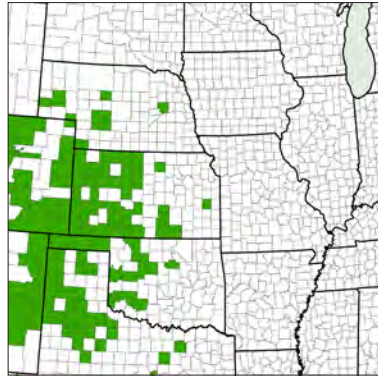
Reproductive Biology: Mead's milkweed is a long-lived species with low reproductive rates and it may take up to 15 years for an individual plant to reach reproductive maturity (U. S. Fish and Wildlife Service 2003). The species is believed to have an outcrossing breeding system and does not usually produce seed when self-pollinated. Therefore, small populations with low genetic variability may have reduced reproductive capacity (U. S. Fish and Wildlife Service 2003).

Recovery efforts: Since 1996, the USDA's Natural Resources Conservation Service, Kansas Biological Survey, and United States Fish & Wildlife Service have been working toward the restoration and recovery of Mead's milkweed. As part of this effort, the USDA-NRCS Plant Materials Center at Manhattan, Kansas has investigated the species' germination requirements and evaluated propagation and establishment techniques. Recent recovery efforts include the introduction of numerous juvenile plants to the Marais des Cygnes National Wildlife Refuge in Linn County, Kansas, during 2009. Monitoring of this introduction effort is ongoing and initial results have indicated a high survival rate.

Asclepias engelmanniana Engelmann's milkweed



Photo: Leslie Landrum



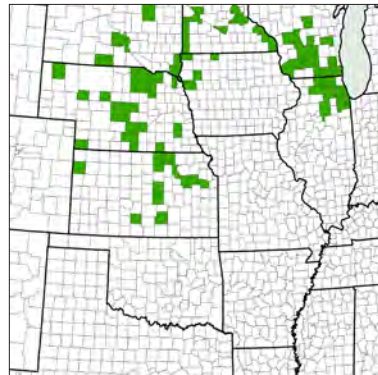
USDA NRCS PLANTS Database
Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Conservation status: Endangered in Iowa.
Flower color: Corolla green, corona yellow
Bloom time: June – August
Description: This species' historical occurrences in western Iowa represent the northeastern extent of its documented range. Iowa is currently the only state in which Engelmann's milkweed has special conservation status. Across its range, the species grows in sandy or rocky limestone mixed and shortgrass prairies (Freeman and Schofield 1991) and also in swales, open sandy hillsides, draws, washes, and bottoms (Woodson 1954).

Asclepias lanuginosa Sidecluster milkweed, woolly milkweed



Photo: Craig Freeman, R.L. McGregor Herbarium



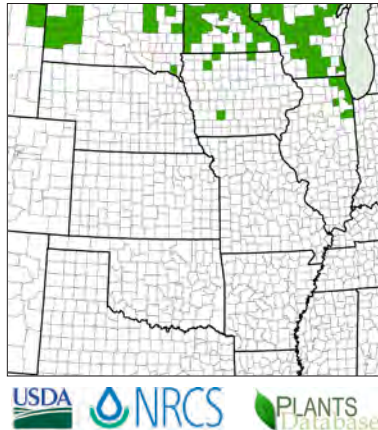
USDA NRCS PLANTS Database
Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Conservation status: Endangered in Illinois; threatened in Iowa and Wisconsin; S1 (critically imperiled) in Kansas.
Flower color: Corolla pale yellow or green, corona cream to white
Bloom time: May – July
Description: Woolly milkweed grows in upland shortgrass and tallgrass prairies, including hillsides, in dry rocky, sandy, or gravelly soils. In Illinois, populations have been lost to overgrazing and gravel mining (Herkert and Ebinger 2002). In a study that compared the reproductive biology of 18 midwestern milkweeds, *A. lanuginosa* was one of two species that set the fewest seeds per stem (Betz and Lamp 1992). In Illinois, populations usually consist of only a few plants that rarely produce seeds (Herkert and Ebinger 2002). In addition to habitat loss, low reproductive output may be a factor in this species' decline.

Asclepias ovalifolia Oval-leaf milkweed



Photo: Andy and Sally Wasowski, Lady Bird Johnson Wildflower Center



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Conservation status: Endangered in Illinois and Michigan; threatened in Wisconsin.

Flower color: Corolla and corona both cream to white, sometimes tinged with pink or yellow.

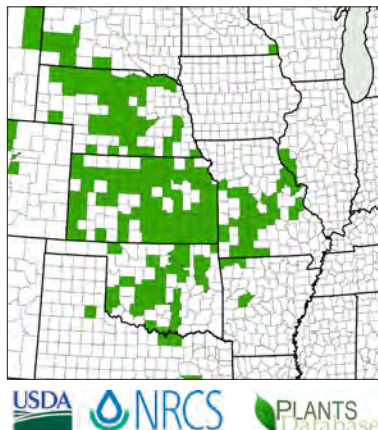
Bloom time: June – July

Description: The species' historical occurrences in northeastern Illinois represent the southeastern limit of its range. Oval-leaf milkweed prefers sandy or silt loam soils (Betz and Lamp 1992) and grows in prairies, savannas, open woods, and gravelly knolls (Woodson 1954; Herkert and Ebinger 2002).

Asclepias stenophylla Slimleaf milkweed



Photo: Janice Lynn, Lady Bird Johnson Wildflower Center



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Conservation status: Endangered in Illinois, Iowa, and Minnesota; SH (possibly extirpated) in Arkansas; S1 (critically imperiled) in Louisiana.

Flower color: Corolla pale yellow or green, corona cream to white

Bloom time: June – August

Description: This species' occurrences in the three midwestern states where it is endangered represent the northeastern limit of its range. Slimleaf milkweed has a broad distribution across Nebraska, Kansas, and Oklahoma. It grows in sandy, rocky upland prairies, including hillsides and hay meadows. The transitioning of early successional habitats to forest is considered a threat to the species' survival in Illinois (Herkert and Ebinger 2002). In a study that compared the reproductive biology of 18 midwestern milkweeds, *A. stenophylla* was one of two species that set the fewest seeds per stem (Betz and Lamp 1992). In addition to habitat loss, low reproductive output may be a factor in this species' decline.

Additional Species

Eight milkweeds have multiple documented occurrences within the region covered by this document, yet seed sources are scarce or certain habitat requirements limit their applicability in restoration efforts. While there is limited potential to include these species in conservation practices that involve seeding, their populations can be protected and managed where they occur.

A. amplexicaulis (clasping milkweed)
A. arenaria (sand milkweed)
A. latifolia (broadleaf milkweed)
A. pumila (plains milkweed)

A. purpurascens (purple milkweed)
A. quadrifolia (fourleaf milkweed)
A. variegata (redring milkweed)
A. viridiflora (green comet milkweed)

Finally, the following milkweeds have a very limited distribution within the central United States. For many of these species, their occurrences in the region represent the limit of their range.

A. exaltata (poke milkweed)
A. involucrata (dwarf milkweed)
A. obovata (pineland milkweed)
A. oenotheroides (zizotes milkweed)

A. perennis (aquatic milkweed)
A. rubra (red milkweed)
A. subverticillata (horsetail milkweed)
A. uncialis ssp. *uncialis* (wheel milkweed)

Please refer to the USDA PLANTS database (<http://plants.usda.gov>) for photos and range maps of these species.

For More Information

The Xerces Society offers a range of resources to help with milkweed, monarch butterfly, and pollinator conservation:

- **Pollinator Conservation Program** (www.xerces.org/pollinator-conservation). This provides nationwide training, consultation, and technical support on how to protect, manage, and restore habitat for bees, butterflies, and other beneficial insects.
- **Pollinator Conservation Resource Center**. An online database that includes pollinator plant recommendations, guidelines on establishing and protecting pollinator habitat, and lists of native plant nurseries for every region of the United States and Canada. <http://www.xerces.org/pollinator-resource-center/>
- **Guidelines for Creating Habitat**. In collaboration with the USDA-NRCS, Xerces has developed in-depth regional guidelines on installing and maintaining habitat for bees in the form of wildflower meadow or hedgerow plantings: <http://www.xerces.org/pollinator-conservation/agriculture/pollinator-habitat-installation-guides/>
- **Project Milkweed**. This initiative promotes milkweed conservation and increases native milkweed seed availability in key areas of the monarch butterfly's North American breeding range: www.xerces.org/milkweed.
- **Western Monarch Conservation Campaign**. A project focused on the conservation and management of western monarch overwintering habitat: <http://www.xerces.org/western-monarchs/>.

Other sources of information:

- **Monarch Watch**. Based at the University of Kansas, Monarch Watch has implemented the Monarch Waystation Program and the Bring Back the Monarchs campaign, and their website features numerous milkweed species profiles. Regionally appropriate milkweed transplants can be purchased from their online Milkweed Market. Please visit www.monarchwatch.org to learn more about their work.
- **Farm Bill conservation programs**. For information on Farm Bill conservation programs that can support creation of pollinator habitat or plantings with milkweed on agricultural lands, please contact your local NRCS service center (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/local/>).

If you would like more information about using native milkweeds in restoration and revegetation efforts in the central United States, please contact:

Brianna Borders, Xerces Society Plant Ecologist (855-232 6639; milkweed@xerces.org) or Chip Taylor, Director of Monarch Watch (888-824 4464; chip@ku.edu)

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Appendix to the Pollinator Plants of the Central United States: Native Milkweeds (*Asclepias* spp.)

Milkweed Seed Vendors

Following is a list of vendors that regularly have milkweed seed in stock. While some of them are not based in the central U.S. region that is described in the accompanying publication, they sometimes carry seed that is source-identified to the region. Before making a purchase, please ask vendors about the origin of their seed and endeavor to use seed that is sourced as locally to your property or project site as possible.

Companies denoted with an asterisk * carry seed of at least one milkweed species in quantities of one pound or more. Companies not marked as such typically sell seed by the ounce or in small packets.

The companies are listed in alphabetical order. This list is not complete and does not constitute a guarantee of reliability or quality of product. The Natural Resources Conservation Service does not endorse any supplier and no discrimination is intended by omission.

Allendan Seed Company

1966 175th Lane, Winterset, IA 50273
Ph: (515) 462-1241 Fax: (515) 462-4084
www.allendanseed.com
allendan@allendanseed.com

Applewood Seed Company*

5380 Vivian St., Arvada, CO 80002
Ph: (303) 431-7333 Fax: (303) 467-7886
www.applewoodseed.com
sales@applewoodseed.com

Cardno JFNew Native Plant Nursery*

128 Sunset Drive Walkerton, Indiana 46574
Ph: (574) 586-2412 Fax: (574) 586-2718
<http://www.cardnojfnew.com/Nursery.aspx>
nurserysales@cardno.com

Educational Science*

P.O. Box 747, League City, TX 77574-0747
Ph: (281) 554-9783 Fax: (281) 557-4340
www.educationalscience.com
educationalscience@msn.com

Georgia Vines

Ph: (912) 312-3762
<http://www.georgiavines.com/>

Hamilton Native Outpost, LLC

16786 Brown Rd, Elk Creek, MO 65464
Ph: (417) 967-2190 Fax: (417) 967-5934
www.hamiltonseed.com
natives@hamiltonnativeoutpost.com

Hoksey Native Seeds

12547 Hwy T-38S, Lynnville, IA 50153
Ph: (641) 780-1539 Fax: (855) 594-3305
www.hokseynativeseeds.com
info@hokseynativeseeds.com

Ion Exchange, Inc.*

1878 Old Mission Drive
Harpers Ferry, IA 52146
Ph: (563) 535-7231 Fax (563) 535-7362
www.ionxchange.com
hbright@ionexchange.com

Missouri Wildflowers Nursery

9814 Pleasant Hill Road
Jefferson City, MO 65109
Ph: 573-496-3492 Fax 573-496-3003
www.mowildflowers.net
mowldflrs@socket.net

Osenbaugh's Prairie Seed Farms*

11009 542nd Street, Lucas, IA 505151
Ph: (800) 585-2788 Fax (641) 766-6795
www.prairieseedfarms.com
info@prairieseedfarms.com

Prairie Moon Nursery*

32115 Prairie Lane, Winona, MN 55987
Ph: (866) 417-8156 Fax: (507) 454-5238
www.prairiemoon.com
info@prairiemoon.com

Shooting Star Nursery

160 Soards Road, Georgetown, KY 40324
Ph: (866) 405-7979
www.shootingstarnursery.com

Wilson Seed Farms, Inc.

10872 1400 E Street, Tiskilwa, IL 61368
Ph: (815) 878-8572 Fax: (815) 366-9050
www.wilsonseed.com
cwilson5@hotmail.com

Native American Seed

3791 N US Hwy 377, Junction, TX 76849
Ph: (800) 728-4043 Fax: (800) 728-3943
www.seedsource.com
info@seedsource.com

Pheasants Forever*

1011 Alexander Avenue, Elba, NE 68835
Ph: (308) 754-5339
www.nebraskaPF.com
pberthelsen@pheasantsforever.org

Roundstone Native Seed, LLC*

9764 Raider Hollow Road, Upton, KY
42784
Ph: (888) 531-2353 Fax: (270) 531-3036
www.roundstoneseed.com
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Stock Seed Farms*

Murdock, Nebraska
Ph: (800) 759-1520
www.stockseed.com