Growing Milkweed in Non-Crop Areas to Benefit the Monarch Butterfly

Written by Harold D. Coble, Ph.D., professor emeritus of the faculty of North Carolina State University and made possible by a grant from BASF.

Executive Summary

Monarch butterfly populations have been declining in the United States since the late 1990s. One of the many factors contributing to this decline is the shrinking number of milkweed plants. Milkweed is a critical component in the monarchs' reproduction cycle. The majority of monarchs fly north from central Mexico in spring and summer, landing in central and eastern parts of the United States. During this migration, adult female monarchs lay eggs only on milkweed plants. When the eggs hatch, the resulting larvae feed on milkweed leaves.

Major stretches of farmland lie within the monarchs' migration path. By allowing milkweed species to grow on land not reserved for crops, American farmers can play a key role in helping maintain and restore the monarch population. This article explains the vital natural connection between monarchs and milkweed, and provides guidance on how farmers can establish the plants to help preserve this beloved butterfly species.

Milkweed is a critical component in the monarchs' reproduction cycle.

The Life of the Monarch

The monarch butterfly is an iconic species that overwinters as an adult, typically congregating in large numbers to roost in trees. The majority of monarchs overwinter in central Mexico, and start to move north in February through the central and eastern parts of the United States, and as far north as southern Canada during the spring and summer (Cockrell et al. 1993). A smaller population of monarchs overwinters in southern California, and migrates northward into Oregon and Washington state.

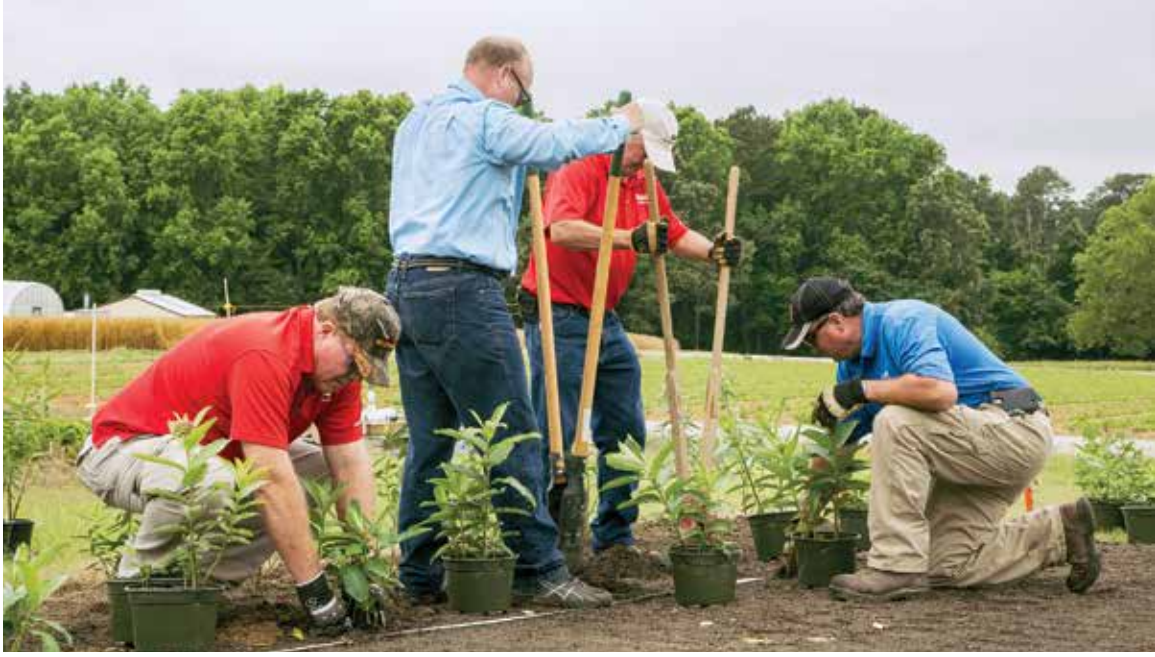
During the northward migration, monarchs require milkweed species for reproduction. Adult mated females lay eggs on the underside of milkweed leaves or on a milkweed flower. Eggs hatch between three and eight days later and the resulting larvae feed on milkweed leaves.

Two-to-three generations of butterflies will procreate during the summer.

Larvae go through five stages of development (instars) during a nine to 14-day period until they are ready to pupate. Pupation is the period of metamorphosis from larvae to adult. The change occurs in a sack produced by the larvae called a chrysalis that attaches to milkweed plants or some other stable structure.

When the pupation period is complete in two to five weeks, adults emerge from the chrysalis and the northward migration continues. Meanwhile, the cycle of mating, the production of eggs and the transformation from larvae to pupae to adult continues. Adult monarchs normally live for three to five weeks during this reproductive phase.

The vast majority of monarch butterfly reproduction occurs in the northern-central region of the United States, known as the Corn Belt. Two-to-three generations of butterflies will procreate during the summer. By mid-to-late August, the northern migration ends and adult monarchs begin their southern migration, returning to their winter roosting site usually by late autumn. When the southern migration begins, adults enter reproductive diapause and don't depend on milkweed to propagate.



Planting milkweed at the BASF research farm in Holly Springs, NC.

Land not used for crops could support milkweed communities without interfering with agricultural production.

Monarch populations have been on the decline since the late 1990s (Monarch Joint Venture 2015). One reason may be the reduction in milkweed abundance in crop fields resulting from effective control measures used by growers (Hartzler 2010, Pleasants & Oberhauser 2012). Therefore, increasing the abundance of milkweeds in monarch-habitat areas should help stabilize or increase the population of the butterflies.

Throughout farming regions, land not used for crops could support milkweed communities without interfering with agricultural production. Those areas include fencerows, grassed waterways, CRP lands, railroad and power transmission rights-of-way, and highway interchanges. Livestock-grazing land should be avoided because of the potential toxicity of milkweeds to mammals.

To increase milkweed abundance, growers and others in the agricultural community must be at the forefront of planning, supporting and executing this effort.

The Nature of Milkweed

Milkweeds are warm-season perennial plants, living more than one year and reproducing from both seeds and vegetative buds arising from lateral roots.

Over 100 species of milkweed have been identified as native to the United States and Canada, mostly of the genus *Asclepias*. With few exceptions, these plants have a milky sap that can be toxic to mammals if ingested in large enough amounts.

Monarchs depend on only a few of the many species of milkweed for reproduction. Of these, common milkweed (*Asclepias syriaca*), is by far the most frequently used in the central U.S. farming region. Studies have shown that up to 90 percent of overwintering monarchs tested in Mexico completed the larval stage on common milkweed (Malcolm et al. 1993).

Other milkweed species that play a lesser but significant role for monarchs include swamp milkweed (*Asclepias incarnata*) in the western Corn Belt and green milkweed (*Asclepias viridis*) in the southern United States. Non-native tropical milkweed (*Asclepias curassavica*) has been introduced in the Gulf Coast States, but may be detrimental to monarchs because of a parasite associated with that species (Monarch Joint Venture 2014).

Common milkweed plants emerge in the spring as the soil warms. Most plants grow from buds on lateral roots of established plants because seedlings are not vigorous competitors and very few seedlings survive in natural settings.

In farming areas, common milkweed seedlings are susceptible to many commonly used herbicides as well as tillage. Any seedlings that do emerge and survive will develop buds on their roots capable of producing new plants within four to six weeks. Seedling plants typically will not bloom during the first year (Bhowmik 1994).

Plants from root buds are much more vigorous than seedlings and will grow rapidly, reaching up to 6 feet in height under good growing conditions. These perennial plants begin blooming in April in the southern part of their range, with most plants in the Corn Belt blooming in late May through July. The bloom stage usually coincides with the arrival of monarchs on their northward migration to breeding grounds.

Common milkweed plants produce relatively few seeds compared to some other weedy species. Individual plants average about six seed pods per plant, with 200 to 400 seeds per pod (Bhowmik & Bandeen 1976). Seeds typically mature in August through September, and are released from the mother plants as the pods dry and split open in October. Seeds have a tuft of floss called a comma that allows wind to carry them a considerable distance from the pods. Milkweed seeds are dormant when released and require a period of cold, moist conditions to break dormancy and germinate (Baskin & Baskin 1977). Development of adventitious buds on roots occurs throughout the summer, and those buds remain dormant until the next growing season.

Collecting and Storing Milkweed Seeds

Milkweed seeds should be collected after they are mature but before the seed pods split and seeds are released into the environment. Seeds are mature when seed pods have turned a yellow to purplish color and the seeds are brown, usually by early to mid-September in the central U.S. (Evetts & Burnside 1973). Because seed pods normally begin to release seeds in October, they should be collected before then. Once seed pods are removed from plants, they can be broken open and the brownish colored seeds removed by raking them out of the pod by hand. Removing the seeds in this manner will also remove the comma, leaving the seed ready for storage.

After removal from the pods, seeds should be dried for a few days, and then stored in cool, moist conditions until they are ready for planting in spring. One convenient storage method is to place the seeds between layers of moist paper towels and enclose in a sealable plastic bag. The bag should be placed in a refrigerator at approximately 40 degrees Fahrenheit and kept there until ready for planting. Another successful storage method: Place mature seeds in a fine mesh sack, such as a piece of nylon hosiery, and bury the sack 3-to-4-inches deep in soil over winter until time for planting. Make sure to exhume the seeds before the spring warmup.

Establishing Milkweed Stands in Non-crop Areas

Milkweed stands are most effectively established in non-crop field conditions by transplanting seedlings that have been grown for four to six weeks in a controlled environment, such as a greenhouse. Or excised root segments containing adventitious buds can be planted.

Direct seeding into field conditions is less likely to be successful because of uncertain seed germination, lack of competitiveness of young seedlings, and other factors, including insect predators and disease. To nurture seedlings for field establishment, take seeds that have been stored over winter in cool, moist conditions and plant them in a warm environment with full daylight about four to six weeks before the last expected frost date for the location. Small (about 3 inch diameter) peat pots work well for growing seedlings because they can be planted directly into the field without removing seedlings from the pots. Seeds should be planted about ¼ to ½ inch deep in a potting mix and watered thoroughly.

Pots should be checked daily to make sure the potting mix does not dry out; conversely, they should not be kept saturated. Since milkweed seed germination rates are seldom 100 percent, the best approach is to plant two or three seeds per pot. Thin to one plant per pot if necessary.

Once the danger of frost has passed, seedlings may be transplanted into the selected non-crop location. Ideally, milkweeds should be established in locations with at least six hours of sunlight, full exposure preferred. Remove any surrounding vegetation prior to transplanting milkweeds to avoid competition (Evetts & Burnside 1975).

Either tillage or a broad spectrum herbicide, such as glyphosate, can be used to remove competing vegetation before transplanting milkweed. If milkweeds are to be established in small patches, they should be spaced about 3 feet apart.

When starting from seed, acquire mature seeds that have been stored over winter in cool, moist conditions.

A root segment from mature milkweed plants is a more viable option for establishing a strong plant.

Plant milkweed in outdoor location that receives at least six hours of sunlight daily.

Seven Steps to Starting a Milkweed Stand

1. SEED/ROOT
2. POT
3. PLANT
4. SPREAD
5. WATER
6. GROW
7. MOW

Details on the back page

To cover larger areas over time, plant individual milkweed plants about 15 to 20 feet apart. In that case, surrounding vegetation can be removed in about a 2-foot diameter circle for each individual milkweed plant. Individual milkweed plants can expand into an area of up to 10 feet in diameter, with as many as 50 plants produced in a two-to-three-year period. When transplanting seedlings in peat pots, it is important to cover the entire peat pot with soil in the field to avoid excessive drying from exposure to air.

Root sections also can be used to establish new milkweed stands by harvesting lateral roots from established plants and transplanting them. The best time to harvest root sections is early spring, around the time of first milkweed emergence. Harvested root sections should be about 6 inches long with one or more visible buds and transplanted 2 to 4 inches deep in the new area. As with seedlings, competing vegetation should be removed before transplanting root sections.

Whether grown from seedlings or root sections, plants should be checked to make sure adequate moisture is available during the year of establishment. If a drought occurs, watering may be necessary.

Also, a small amount of complete fertilizer will speed establishment. New plantings should be inspected occasionally for pest insects, such as aphids, as these insects can delay establishment of new milkweed populations.

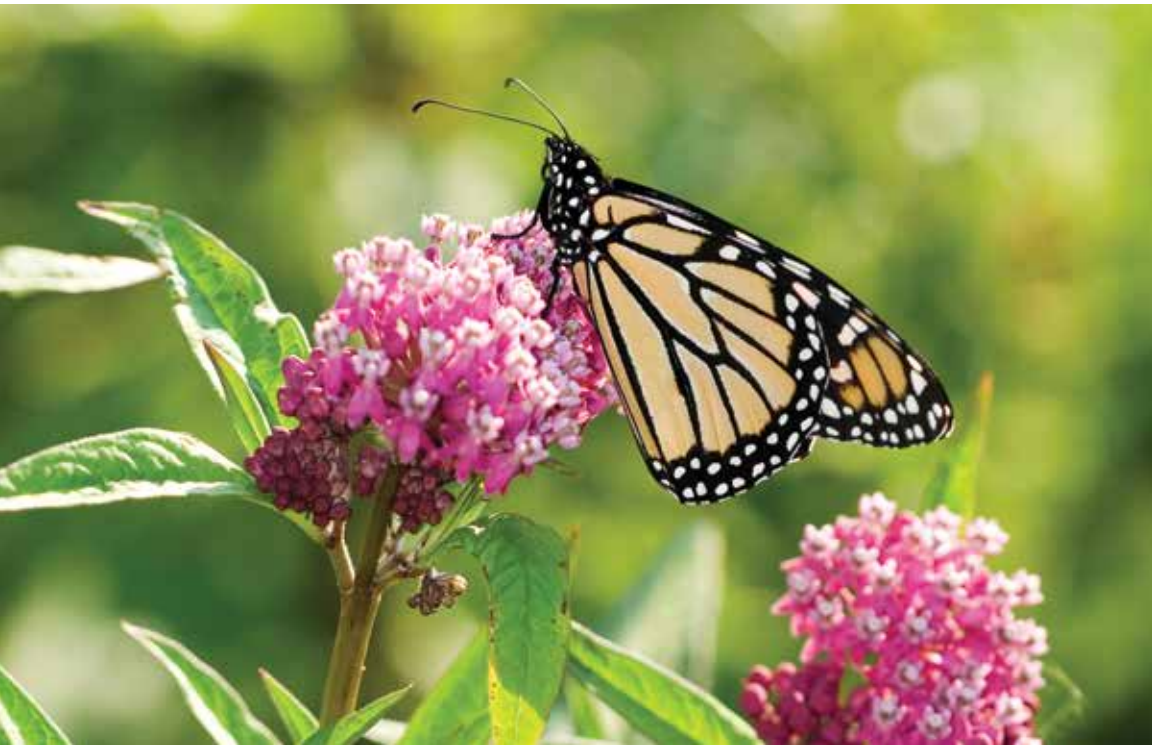
Maintaining Established Milkweed Stands

During the initial year of establishment, competition from other vegetation immediately around milkweed plants should be kept to a minimum. Occasional mowing or other means of removal are fine, but no herbicides should be applied directly to milkweed plants during the first year. Once milkweed plants have been established for a year, they typically can withstand some competition from other vegetation. For monarchs, having other nectar-producing plants in the area as a food source is beneficial.

Although occasional fertilizer applications will promote faster and more extensive milkweed growth, fertilization is not necessary to maintain the population. Also, after the initial year of establishment, milkweed increases its tolerance to many herbicides.

After monarchs have migrated south, the area could be mowed.

Herbicides that may injure milkweed, such as glyphosate, dicamba or picloram, should not be applied directly on the plants. Any herbicide treatment should be timed to minimize the chance monarchs are present. After monarchs have departed on the southern migration, the area could be mowed to control unwanted plants without damage to milkweed populations. Such mowing would be beneficial to control tall-growing weeds and woody species that may invade the established area.



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LIVING ACRES

Seven Steps to Starting a Milkweed Stand

1 **SEED/ROOT** When starting from seed, acquire mature seeds that have been stored over winter in cool, moist conditions. Or plant milkweed using root sections from established plants by harvesting lateral, 6-inch long roots with visible buds in early spring. Roots should be transplanted 2 to 4 inches deep in an area where surrounding vegetation has been removed.

2 **POT** Four to six weeks before the last expected frost, plant two or three milkweed seeds in peat pots and place in a warm environment, such as a greenhouse, with full daylight.

3 **PLANT** Dig a small hole and plant seedling peat pots in outdoor locations that receive at least six hours of sunlight daily. Cover each peat pot completely with soil.

4 **SPREAD** Place seedlings in groups spaced 3 to 4 feet apart in an area free of competing vegetation. Alternately, individual seedlings can be planted 15 to 20 feet apart. Remove competing vegetation in a 2-foot diameter circle.

5 **WATER** If rainfall isn't sufficient, water the milkweed seedlings. Use a small amount of fertilizer to speed the establishment of the plants.

6 **GROW** To allow the plants to establish, don't directly apply herbicide to milkweed for the first year. Herbicides (with a few exceptions) may be used after the first year, but only when monarchs are not present.

7 **MOW** To help milkweed thrive, mow around the established area to control unwanted plants, like invasive tall-growing weeds and woody species. However, neighboring nectar-producing plants are beneficial as a food source for monarchs.

Living Acres, a research-driven effort from BASF, focuses on protecting monarch habitat and increasing biodiversity alongside modern agriculture.

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