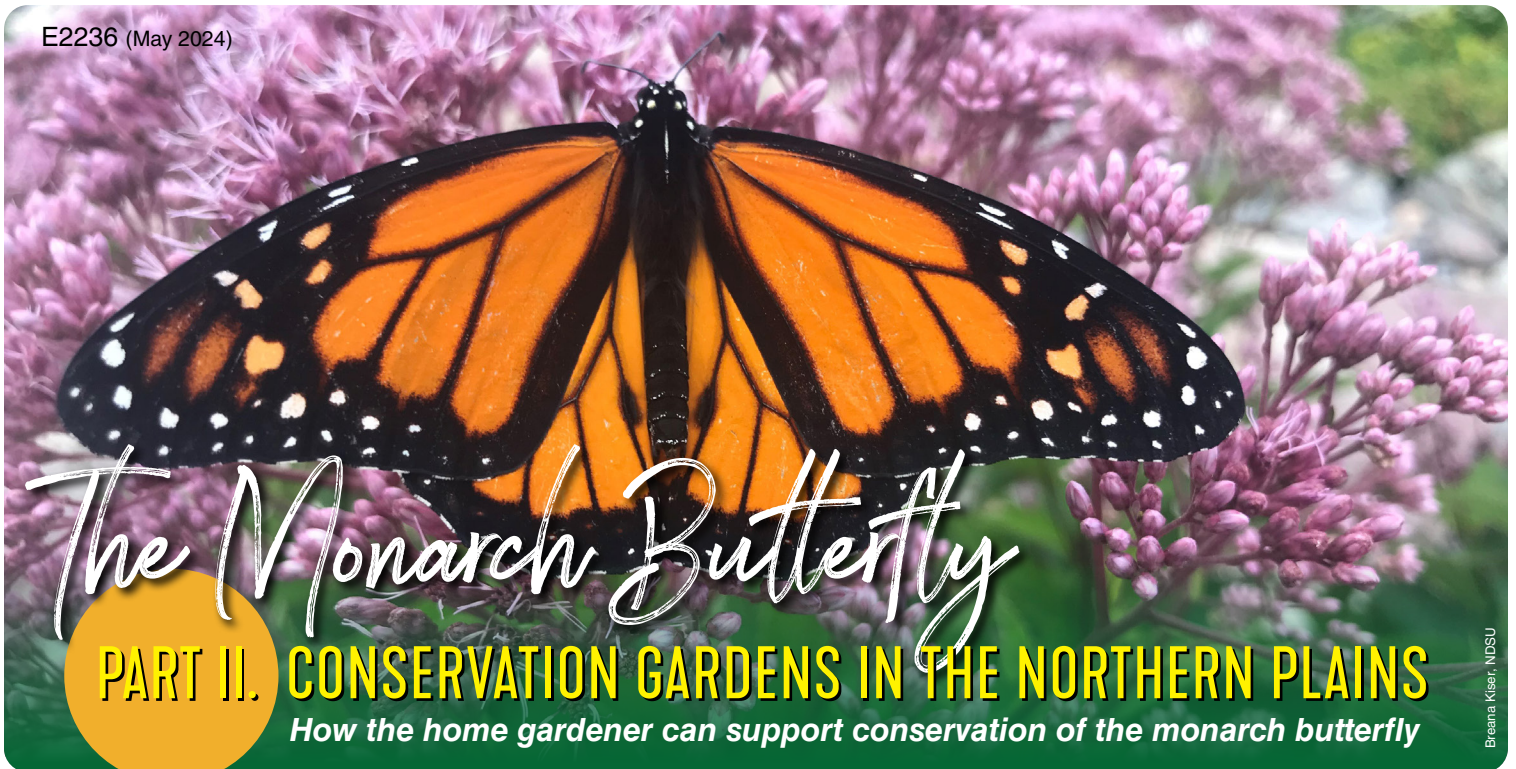


E2236 (May 2024)



The Monarch Butterfly

PART II. CONSERVATION GARDENS IN THE NORTHERN PLAINS

How the home gardener can support conservation of the monarch butterfly

Breana Kiser, NDSU

April Johnson, Extension Pollinator Technician, NDSU • Esther McGinnis, Extension Horticulturist, NDSU • Janet Knodel, Extension Entomologist, NDSU

MONARCHS IN DECLINE

The decline of monarch butterfly (*Danaus plexippus*) populations is a multifaceted problem driven by environmental challenges. The pervasive use of pesticides, persistent climate change, and abnormal or extreme weather events disrupt critical stages of their life cycle, including their arduous annual migration that spans up to 3,000 miles. However, amid this complex array of threats, one stands out as the primary catalyst for monarch decline: habitat destruction. The elimination of native milkweeds from agricultural, residential and urban landscapes, coupled with the illicit logging of trees in their overwintering sites in Mexico, poses an existential threat to monarch butterflies.

The steep reduction in milkweed populations emerges as a particularly alarming concern. As the sole host plant for monarch larvae, milkweeds are indispensable to the species' survival. From 1999 to 2016, an estimated 850 million milkweed plants vanished from agricultural fields due to herbicide use, while the ongoing conversion of native prairie into cropland and urban sprawl continues to claim approximately 2 million milkweed plants annually. This decline

deprives monarchs of essential breeding grounds and disrupts the delicate balance of their intricate ecosystem. As these vital plants rapidly disappear, the foundation of monarch survival hangs in the balance, underscoring the urgent need for decisive action to conserve their habitats.

This publication equips home gardeners with the knowledge necessary to create attractive and functional gardens that will serve as neighborhood oases for this important species. For more information on the monarch, see the companion publication, *The Monarch Butterfly: Part I, Migration and Life Cycle* at www.ndsu.edu/agriculture/extension/publications/monarch-butterfly-part-1-migration-and-life-cycle.



David Cappeart, Bugwood

UGA2107048

NDSU

EXTENSION

North Dakota State University, Fargo, North Dakota

CREATING A MONARCH CONSERVATION GARDEN

Northern Plains home gardeners can help to improve the welfare of migratory monarch butterflies as they move through the region by establishing monarch conservation gardens. These provide the essentials monarchs need to thrive: nectar, milkweed, shelter plants and reliable water sources. The effectiveness of gardens as habitat depends on the garden's ability to attract ovipositing (egg-laying) adults, support larval diet and development, serve as shelter for adults during rest periods and provide rich sources of nectar to sustain the adults through long migratory flights.

Monarch conservation gardens serve as stepping stones between the increasingly isolated and reduced patches of native prairie habitat. Milkweed has the potential to grow faster, survive better and generally appear more vigorous in the home garden than in the wild because the plants have access to resources and care provided by the home gardener. By replacing a landscape dominated by mowed turfgrass, home gardeners have the opportunity to restore residential property to habitat that conserves monarchs.

PLANTING DESIGN

When designing the garden space, plant milkweeds in a border surrounding a patch of nectar-producing flowers and tall grasses. This configuration provides visual cues for flying monarchs seeking habitat in which to lay eggs. They are more likely to see milkweed plants on the perimeter of the garden than if they are in the middle of the planting. In a recent study, eggs and larvae were 2.5 to 4 times more abundant in conservation plots with this configuration than those with mixed or random patterns. Larvae developing on the milkweed will eventually form a chrysalis. When the adult butterfly emerges, it can easily find the nectar sources within the border. Consider the diagram below (Figure 1) to determine what strategies you can employ in your garden. If space in the garden is limited, an adjacent row of milkweed may serve in place of a border.

Figure 1. Effective Monarch Conservation Gardens

The most effective monarch conservation gardens have milkweeds as host plants, nectar sources and habitat patches. This diagram does not include measurement of scale because efficacy of the conservation garden does not correlate with dimension.

Milkweeds as host plants

Size matters. The larvae laid on small, isolated plants are at risk of resource depletion and may not complete development.

Nectar sources

Group nectar sources by color to enhance visual cues and prioritize plants with vibrant floral displays to elevate the garden's attractive power.

Monarchs do not have strict color preferences but learn associations between colors and nectar reward.

Increase diversity of nectar sources and milkweeds to recruit more adults and reduce time adults spend searching for nectar sources after they emerge from the chrysalis.

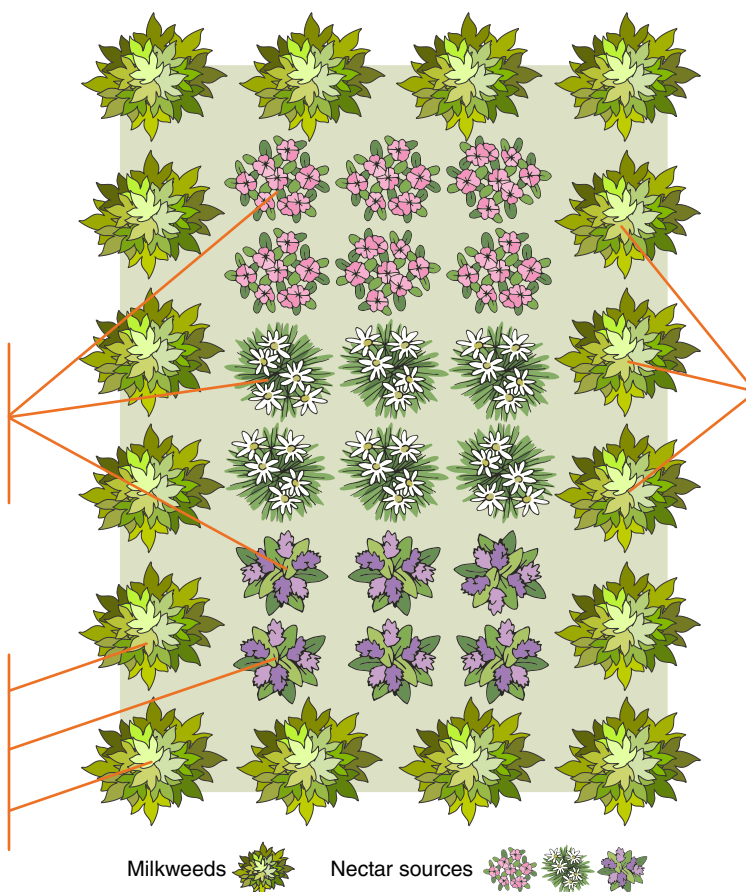
Habitat patch attributes

Monarchs make choices according to visual cues, so establish sites away from tree cover, buildings and other structures that might impede visibility.

Hedge the flower plot with a 3-foot wide border of milkweeds to increase oviposition and larval density.

Establish the garden away from road pollution runoff and traffic exhaust to protect plants' nutritional quality.

Mimic the migration flight pattern by establishing the garden in a north-south orientation to catch the attention of butterflies and to increase egg laying.



FLOWER COLOR OF NECTAR PLANTS

Research has shown that butterflies generally prefer white and warm colors such as yellow, orange, red, and pink, but monarch color preferences are more flexible. Monarchs make connections between the color of a blossom and the amount of nectar it provides. Such connections may aid adult monarchs in developing color preferences for nectar sources.

Monarchs respond to visual cues, and plants grouped by color act as highly visible beacons for migrating adults, more so than mixed plots. In the monarch conservation garden, it is more effective to organize plants in color blocks using multiple plants of the same species or cultivar together to increase their visibility from the air.

PLANT SELECTION

Milkweed for Egg Laying and Larval Food

Milkweed is essential for monarch conservation; the species cannot exist without it. Therefore, milkweed should make up a majority of the plants in a monarch conservation garden. To attract monarchs to the garden, adult females must be able to detect those species that are best suited



Esther McGinnis, NDSU



Jim Occi, Bugwood

54354

for oviposition. Egg-laying females make choices based on the height of the milkweed, preferring taller, more visually prominent plants near nectar sources. Adult females prefer laying eggs on swamp milkweed (*Asclepias incarnata*), which can range from 3- to 5-foot tall, over other species. Larvae in the same study developing on swamp milkweed experienced the highest survival rate and growth.

Swamp milkweed is an excellent choice for home gardens in eastern North Dakota because it thrives in moist loamy to clay soils and doesn't spread via rhizomes like common milkweed (*A. syriaca*). Despite its name, swamp milkweed does not require wetland conditions and will thrive in a garden setting. However, the plants should be irrigated during times of drought to ensure survival.

Butterfly milkweed (*A. tuberosa*) is another well-behaved species that lacks rhizomes and does well in a compact gardening setting. This species is better adapted to the drier, sandier soils of central and western North Dakota and is short-lived on predominantly clay soils. The beautiful orange blossoms are produced earlier in summer than other milkweed species.

The nursery industry has released ornamental cultivars of the native species of both swamp and butterfly milkweed. Early studies show that the cultivars are similar to the wild species in attracting monarchs.

Common milkweed may be too aggressive for small gardens because it spreads vigorously by rhizomes and it also reseeds. This is an unwelcome plant in farm fields and is labeled as a noxious weed in a small number of counties in North Dakota. However, it is not labeled as a state noxious weed.

Like swamp milkweed, common milkweed is a preferred species for egg-laying adults and is necessary for the long-term survival of monarchs. Common milkweed is frequently planted in larger, naturalized areas such as pollinator meadows where the plant has room to spread. Showy (*A. speciosa*) and prairie (*A. sullivantii*)

milkweed have beautiful flowers and are considered less aggressive than common milkweed. However, both species still spread by rhizomes and may be better suited for naturalized areas.

Studies show that monarchs are drawn to plots with multiple species of milkweed so consider adding more than one of the species listed in Table 1. Milkweed looks its best from June through September in North Dakota, but monarchs are still migrating south through October. Therefore, consider leaving milkweed undisturbed in the garden long into fall, even after it passes its most attractive stage.



Table 1: Milkweed selections for the monarch conservation garden



Common Name	Scientific Name	Bloom Time	Flower Color	Moisture Conditions	Height (feet)	Risk of Spread
Butterfly Milkweed	<i>Asclepias tuberosa</i>	June-July	Orange-yellow	Dry to Mesic	1-3'	Low; does not spread by rhizomes
Swamp Milkweed	<i>Asclepias incarnata</i>	July-August	Pink	Mesic to Wet	3-5'	Low; does not spread by rhizomes
Showy Milkweed	<i>Asclepias speciosa</i>	June-August	Pink	Dry to Mesic	1.5-4'	Medium; has rhizomes but somewhat less aggressive than common milkweed
Prairie Milkweed	<i>Asclepias sullivantii</i>	June-August	Pink	Mesic to Wet	3'	Medium; has rhizomes but somewhat less aggressive than common milkweed
Common Milkweed	<i>Asclepias syriaca</i>	June-August	White, purple	Dry to Wet	3-5'	High; will spread aggressively by rhizomes
Whorled Milkweed	<i>Asclepias verticillata</i>	May-September	White, green	Dry to Mesic	1'	High; will spread aggressively by rhizomes



Nectar Plants for Adults

Adult monarchs are sustained by nectar from many flowering plants and do best with a diverse collection. Non-native plants can provide nectar to monarchs just as adequately as natives, and native plant sources often are limited to what is popular at local nurseries. However, native plants sustain not only monarch butterflies but also native bee populations that have coevolved for the most efficient symbiotic relationship. Native plants are generally better adapted to local soil and climate conditions.

When choosing plants for a monarch habitat, select an array of plants that will bloom and provide nutrients to keep monarchs fueled throughout their migration (May-October).

Avoid cultivars with double blooms (such as the *Echinacea* series Double Scoop™), as these variants lack adequate pollen and nectar sources. Additionally, maximize plant diversity to increase natural pest management and total health of the garden ecology. Consider any of the plants listed in Table 2 as reliable options for North Dakota.

Other Elements

- Migration is thirsty work so consider adding a water source to conservation gardens. This can be a small pond, fountain or birdbath, or as simple as a small dish with still water and stones or marbles to prevent drowning.
- Trees and shrubs are great additions to the landscape adjacent to conservation gardens as they are useful to adult monarchs as overnight shelter and protection from harsh weather and predators.
- Avoid using insecticides in the monarch garden.
- Once you've implemented these criteria, get your pollinator garden certified by NDSU Extension as an official Pollinator Garden. Apply for certification at <https://tinyurl.com/3mmyxtjn>

**Avoid
coneflowers
with double
blooms.**



Table 2: Floral resources for monarch butterflies in North Dakota

Common Name	Scientific Name	Bloom Time	Flower Color	Moisture Conditions	Height (feet)	Comments
Butterfly Milkweed	<i>Asclepias tuberosa</i>	June-July	Orange-yellow	Dry to Mesic	1-3'	Milkweeds also produce nectar and will attract other butterflies and bees
Black-eyed Susan	<i>Rudbeckia hirta</i>	June-September	Yellow	Mesic	2-3'	Heat and drought tolerant
Purple Coneflower	<i>Echinacea pallida</i> / <i>Echinacea angustifolia</i> / <i>Echinacea purpurea</i>	July	Purple-pink	Dry to Mesic	3-4'	<i>E. angustifolia</i> is native to North Dakota
Swamp Milkweed	<i>Asclepias incarnata</i>	July-August	Pink	Mesic to Wet	3-5'	Milkweeds also produce nectar
Spotted Joe Pye Weed	<i>Eutrochium maculatum</i>	July-August	Pink	Mesic to Wet	6'	Smaller ornamental cultivars can be found in garden centers
Wild Bergamot	<i>Monarda fistulosa</i>	July-August	Pink-purple	Dry	2-5'	<i>Monarda didyma</i> cultivars are smaller and can be found in garden centers; the native wild bergamot may be too large and sprawling for a small garden
Prairie Blazingstar	<i>Liatris pycnostachya</i>	July-August	Pink-purple	Mesic to Wet	2-4'	Does best in medium to wet soils
Meadow Blazingstar	<i>Liatris lingulistylis</i>	August	Pink-purple	Mesic to Wet	3-5'	Pollinator magnet
Smooth Blue Aster	<i>Symphotrichum laeve</i>	August-September	Blue-purple	Mesic	6'	Lovely blue flowers
New England Aster	<i>Symphotrichum novae-angliae</i>	August-September	Pink-purple	Dry to Wet	6'	Fuel for migrating monarchs; smaller ornamental cultivars may be found in garden centers
Showy Goldenrod	<i>Solidago speciosa</i>	September-November	Yellow	Mesic to Dry	4-5'	Non-rhizomatous



PEST CONTROL IN THE MONARCH GARDEN

In a thriving garden, diverse insect populations facilitate essential ecological processes such as pollination, natural pest control, nutrient cycling, and provide a primary food source for various other garden inhabitants including birds, small mammals and reptiles. Increased insect activity in such a garden not only signifies its vitality but also highlights the intricate web of life that sustains it, promoting resilience, productivity and sustainability. Therefore, when you cultivate a garden enriched with plant diversity, expect to host a flourishing community of insects.

Some insect pest populations may spike under rare conditions such as a lack of predator populations, an excess of foraging sources or an outbreak of plant disease. While the easiest and most natural approach is often to allow pests to be managed by nature itself, there are effective methods for controlling garden pests without jeopardizing the welfare of critical pollinator species. The oleander aphid (*Aphis nerii*), for instance, is a common milkweed pest that can be dislodged from affected plants by a strong jet of water. Use this method with discretion, as monarch eggs can be evicted from leaves as well.



Svoboda Pennisi, University of Georgia

Aphids on milkweed.



Svoboda Pennisi, University of Georgia

Lady beetle larvae and monarch caterpillar.

REFERENCES

Baker, A. M., & Potter, D. A. (2019). Configuration and Location of Small Urban Gardens Affect Colonization by Monarch Butterflies. *Frontiers in Ecology and Evolution*, 7, Article 474. <https://doi.org/10.3389/fevo.2019.00474>

Cepero, L. C., Rosenwald, L. C., & Weiss, M. R. (2015). The Relative Importance of Flower Color and Shape for the Foraging Monarch Butterfly (Lepidoptera: Nymphalidae). *Journal of Insect Behavior*, 28(4), 499-511. <https://doi.org/10.1007/s10905-015-9519-z>

Cutting, B. T., & Tallamy, D. W. (2015). An Evaluation of Butterfly Gardens for Restoring Environmental for the Monarch Butterfly (Lepidoptera: Danaidae). *Environmental Entomology*, 44(5), 1328-1335. <https://doi.org/10.1093/ee/nvv111>

Ladner, D. T., & Altizer, S. (2005). Oviposition preference and larval performance of North American monarch butterflies on four *Asclepias* species. *Entomologia Experimentalis et Applicata*, 116(1), 9-20. <https://doi.org/10.1111/j.1570-7458.2005.00308.x>

Mitchell, T. S., Agnew, L., Meyer, R., Sikkink, K. L., Oberhauser, K. S., Borer, E. T., & Snell-Rood, E. C. (2020). Traffic influences nutritional quality of roadside plants for monarch caterpillars. *Science of the Total Environment*, 724, Article 138045. <https://doi.org/10.1016/j.scitotenv.2020.138045>

Pleasants, J. (2017). Milkweed restoration in the Midwest for monarch butterfly recovery: estimates of milkweeds lost, milkweeds remaining and milkweeds that must be added to increase the monarch population. *Insect Conservation and Diversity*, 10(1), 42-53. <https://doi.org/10.1111/icad.12198>



TAKE ACTION

Volunteer with the Monarch Larva Monitoring Project (MLMP)

The Monarch Larva Monitoring Project (MLMP) was developed by researchers at the University of Minnesota to collect long-term data on monarch populations and milkweed habitat. This citizen science project involves the general public in collecting data with which to develop a better understanding of the health of the monarch population during the breeding season.

MLMP volunteers participate in several in-person training sessions that cover monarch biology, monitoring procedures, data entry protocols and other important monitoring information. MLMP volunteer efforts contribute to monarch conservation and supply valuable knowledge of butterfly ecology in general.

To learn more about monarch conservation efforts and to volunteer for MLMP, visit

<https://mlmp.org>.

For more information about monarchs and other pollinators, and to stay up to date with conservation news and volunteer projects, follow NDSU Extension Pollinator Conservation on Facebook. Also, see the NDSU Extension publication “The Monarch Butterfly: Part I, Migration and Life Cycle” at www.ndsu.edu/agriculture/extension/publications/monarch-butterfly-part-1-migration-and-life-cycle.



United States Department of Agriculture
National Institute of Food and Agriculture

This publication is supported in part by the U.S. Department of Agriculture, National Institute of Food and Agriculture, Crop Protection and Pest Management - Extension Implementation Program, award number 2021-70006-35330. Any opinions, findings, conclusions or recommendations expressed are those of the authors and do not necessarily reflect the view of the USDA.

NDSU Extension does not endorse commercial products or companies even though reference may be made to tradenames, trademarks or service names.

For more information on this and other topics, see www.ndsu.edu/extension

County commissions, North Dakota State University and U.S. Department of Agriculture cooperating. NDSU does not discriminate in its programs and activities on the basis of age, color, gender expression/identity, genetic information, marital status, national origin, participation in lawful off-campus activity, physical or mental disability, pregnancy, public assistance status, race, religion, sex, sexual orientation, spousal relationship to current employee, or veteran status, as applicable. Direct inquiries to Vice Provost, Title IX/ADA Coordinator, Old Main 100, 701-231-7708, ndsu.eoaa@ndsu.edu. This publication will be made available in alternative formats for people with disabilities upon request, 701-231-7881. 800-5-24