

Monarch Breeding Habitat Assessment Tool

Developed by the University of Minnesota Monarch Lab

In partnership with the Monarch Joint Venture



Assessment Tool Authors: Wendy Caldwell and Karen Oberhauser

Introduction and Monarch Conservation Overview

Monarchs face many risks that are resulting in declining populations in both the eastern and western parts of their North American range. The largest impacts come from the loss of habitat for breeding, migrating, and overwintering. In addition, pesticides used to control insect and plant pests have harmful, unintended consequences for monarchs and other pollinators, and a changing climate may be making some habitats less suitable and forcing changes in migratory patterns. Monarchs also face dangers from predators and parasites throughout their geographic range.

This Monarch Habitat Assessment Tool will help address these issues by informing monarch breeding habitat management by public and private landowners. While there is a great deal of emphasis on conserving winter habitat for monarchs, every monarch that successfully migrates to wintering sites in Mexico or along the California coast begins its life as an egg on a milkweed plant and depends on nectar sources across miles of migratory flyway. The Assessment Tool addresses key characteristics of monarch breeding and migratory sites, and provides a score summed over five sections. The total score reflects the availability of plants that are needed to support monarchs, as well as other site characteristics and management practices. Because of the importance of educating others about monarchs and contributing to our knowledge of monarchs and their habitat needs, the score also reflects the use of the site for education and monitoring. Each section includes an introduction to the importance of the topic and key considerations for improvement in that area. Additional information that can inform site improvement is included in the appendices.

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Wendy Caldwell

Using Assessment Tool

- Complete one assessment for each monarch breeding habitat that you manage.
- Visit site during peak blooming times in spring, summer, and fall to assess nectar availability.
- Use a native plant identification guide(s) to identify plants growing within the site.
- Our goal for the Assessment Tool is to create an online form that will calculate your score, and if you choose, submit the score to a habitat database. Currently, the most efficient way to use the tool is to fill in a hard copy for your own information. If you send us a hard copy (see contact information below), we will begin to create the habitat database. Fill in the information on page 3 if you do send your results, and feel free to include suggestions for modifying the Tool.
- *Optional:* Return completed habitat assessment to
University of Minnesota Monarch Lab
c/o Karen Oberhauser
2003 Upper Buford Circle
135 Skok Hall
Saint Paul, MN 55108
- Questions: monarchs@monarchjointventure.org

Acknowledgements: This tool was developed by Wendy Caldwell and Karen Oberhauser (University of Minnesota Monarch Lab) in partnership with the Monarch Joint Venture. The Xerces Society for Invertebrate Conservation (www.xerces.org) provided a model habitat assessment tool and reviewing expertise. Additional reviewers include Cathy Downs, Ilse Gebhard, Kip Kiphart, Gail Morris, and Sarada Sangameswaran.

Cover page photo credits (left to right): Wendy Caldwell, Denny Brooks, Bill Johnson (Iowa DNR), background - Wendy Caldwell

General Site Information

The following questions address the general structure and surrounding area of your site. These questions will not reflect in your overall site score, but we will use the information to help document monarch habitats throughout North America.

Personal

First Name:

Last Name:

Mailing Address:

Email:

Site Location

City/Township:

County:

State:

Latitude:

Longitude:

Without a GPS unit to find the exact latitude and longitude of your site, please use an online resource

(example: www.mlmp.org/monitoring/geocode.htm) to convert an address or intersection to latitude/longitude coordinates.

How would you describe most of the area immediately surrounding your site? (Choose one)

- Rural Small Town Suburban Urban

What type of site is it? (Choose the best option)

- Garden
 CRP Land (Conservation Reserve Program)
 Other "old field" (not currently used for crops)
 Pasture or grazed
 Restored or reconstructed prairie
 Natural prairie or other natural habitat
 Nature preserve
 Roadside (ditch or strip next to road)
 Agricultural field (specify which crop below)
 Agricultural margin (road ditch, buffer zone)
 Other; please describe:

Which of the following border your site? (Check all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Lawn | <input type="checkbox"/> Body of water (lake, pond, river) |
| <input type="checkbox"/> Agricultural field | <input type="checkbox"/> Deciduous woods |
| <input type="checkbox"/> Residential building | <input type="checkbox"/> Coniferous woods |
| <input type="checkbox"/> Industrial or commercial building | <input type="checkbox"/> Schoolyard or university |
| <input type="checkbox"/> Road | <input type="checkbox"/> Park |

Which of the following are found within your site? (Check all that apply)

- Flowering plants (forbs other than milkweed)
 Native grass
 Lawn grass
 Shrubs (less than 3 meters tall)
 Trees (more than 3 meters tall)
 Natural body of water (pond, lake, river)
 Human-provided water (birdbath, pond, drainage ditch, etc.)

How was your site established? (Choose the best option)

- It grew naturally
 It was established by humans prior to my ownership or monitoring
 I established it

Introduction

Milkweed (genus *Asclepias*) is an essential feature of monarch breeding habitat. There are over 100 species of milkweed in North America, though monarch conservation organizations have prioritized species for each region of the U.S. based on their importance to monarchs and potential to be used in restoration efforts (see Appendix 1).

Many milkweed species are very hardy and grow in various landscapes. Common places to find milkweed include short and tall grass prairies, livestock pastures, agricultural margins, roadsides, wetlands, sandy areas, and gardens. Though monarchs do use sites with few milkweed plants, more plants support more monarchs. Fewer plants may result in higher per plant monarch density, which can increase competition for food between larvae and can lead to the spread of diseases between larvae in crowded conditions.

Native refers to species that originated in a given geographic area. Including native milkweed in your monarch habitat is important. Not only is native milkweed a food source for monarch larvae, but it provides nectar for a variety of other pollinators and habitat for many other organisms. Additionally, native plants are well adapted for the climatic conditions of their region and are easy to care for. Diversity in native plant communities supports many native insects and also provides a number of ecological benefits, such as erosion reduction and filtration.

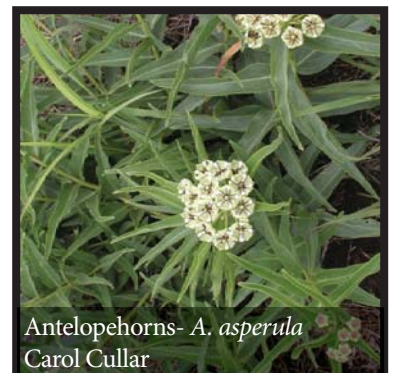
How to improve the value of your site

- Collect and plant **native** milkweed and nectar plant seeds locally. Share seeds with friends and neighbors.
- Encourage nurseries to offer native milkweed species. Before purchasing, ask your nursery to make sure that plants have not been treated with insecticides (dangerous to larvae **and** adults).
- Add native plants to your site, or allow native species to reproduce and spread within the habitat.
- Increase native plant diversity by planting additional species.
- Cut back milkweed if you notice it is diseased (unusual color or plant structure).
- Water milkweed and nectar plants in drought conditions (if possible).

1a. Milkweed Abundance

If unable to accurately estimate milkweed abundance, see Appendix 1 for methods to calculate abundance and for guidelines about counting different milkweed species.

Choose one option below that best describes your site	Possible Score	Score
1-10 plants	1	
11-50 plants	2	
51-100 plants	4	
101-500 plants	6	
501-1000 plants	8	
1001+ plants	10	
Total (Max 10)		



1b. Milkweed Diversity

Refer to Appendix 1 for a guide to native milkweed species in your area.

	Possible Score	Score
Choose one	Only non-native milkweed present (<i>A. curassavica</i> or another species not native to your area)	5
	Native milkweed present	10
Choose one	1 native milkweed species	1
	2 native milkweed species	2
	3-4 native milkweed species	4
	5+ native milkweed species	5
List species:		
Total (Max 15):		

Introduction

Unlike larvae, that rely only on milkweed to survive, adult monarchs use diverse nectar sources for food. Nectar plants are a key component to prime breeding and migrating habitat for monarchs and other pollinators.

Spring blooming nectar plants (blooming approximately March 20—June 1) fuel the monarch migration northward from Mexico and inland from the California coast. Without abundant nectar sources throughout migratory corridors, monarchs are less likely to survive and may not be able to reproduce successfully. Summer blooming nectar sources (blooming approximately June 2—August 15) are vital to sustain a healthy breeding population. Fall blooming nectar plants (blooming approximately August 16—October 30) are equally important; monarchs rely on abundant nectar sources in the fall to store enough energy to survive the long journey to their overwintering sites, and the winter period with minimal nectar availability.

While non-native species can be used for nectar, native nectar plants are more beneficial to an ecosystem. Native plants are well suited for the climatic conditions of an area and are responsible for important ecosystem functions, such as erosion control and filtration. They also provide food for native insects, important components of food webs.

There are many sources of information on appropriate nectar plants for monarchs and other pollinators. Refer to **Section 1: Milkweed** and **Appendix 1** for more resources on planting and identifying native plants.



2. Blooming Nectar Plants

Refer to Appendix 1 for milkweed and nectar plant identification resources.

		Possible Score	Score
Choose one	Only non-native blooming plants present	5	
	Native blooming plants present	10	
Choose one	1-2 blooming species	2	
	3-6 blooming species	4	
	7 or more blooming species	8	
Can list at least 2 nectar plants for each season (spring, summer, and fall)		7	
List spring blooming species:			
List summer blooming species:			
List fall blooming species:			
List winter blooming species (if you live in an area that does not experience winter freezes):			
Total (Max 25):			

Introduction

Any monarch habitat, whether urban, suburban, small town, or rural, can be important to monarchs. Sites in remote natural areas may be more beneficial to monarchs because there is a reduced risk of habitat disturbance. On the other hand, sites near people have greater potential for monarch conservation education for interested passers-by.

A combination of milkweed, abundant and diverse nectar sources, and natural surrounding vegetation make an ideal monarch habitat. Size can also influence monarch use of the site. A dense patch of milkweed in a small area is not as beneficial to monarchs as an area with the same number of milkweed plants distributed over a larger area. Lower milkweed density areas are more attractive to egg-laying females, and reduce the chance for disease to spread between monarchs in that habitat. A larger space can also support higher plant diversity, and thus more insects, including pollinators.

How to improve the value of your site

- Include signage at your site to educate others about your monarch habitat and its importance to you and to monarchs.
- Use your site as an educational tool to teach others about habitat conservation.
- Improve the diversity within your site by planting native milkweeds and/or nectar plants.
- Increase the size of your site by converting low plant diversity areas, like lawns, to monarch habitat.
- Monitor monarch eggs, larvae, and adults at the site (Refer to **Appendix 2** for monarch citizen science project websites and other resources).



Janet Allen



Gayle Steffy



Wendy Caldwell



Bill Johnson, Iowa DNR

3a. Size of Site

Refer to **Appendix 2** for detailed instructions on site delineation and area calculation tools.

Choose one option below that best describes your site

	Possible Score	Score
Small: 1-10 sq. meters (1-107 sq. ft.) - a small garden	4	
Medium: 11-100 sq. meters (108-1076 sq. ft.) - up to the size of 1/2 a tennis court	8	
Large: 101-1,000 sq. meters (1077-10,764 sq. ft.) - up to the size of a baseball diamond infield	10	
Extra large: 1,001-10,000 sq. meters (2.5 acres) - up to the size of 2 football fields	16	
XXL: 10,000+ sq. meters (2.5+ acres) - large fields and bigger	20	
Total (Max 20):		

3b. Education and Monitoring

Choose all that apply

	Possible Score	Score
Site contains sign(s) to promote monarchs or monarch conservation	4	
Site is used to educate others about monarchs or monarch conservation	4	
Monarch monitoring data are collected at the site and reported to a citizen science project	7	
Total (Max 15):		



Linda Gebhart

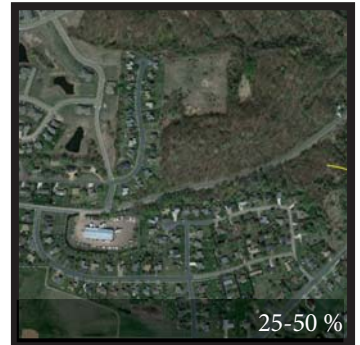
Introduction

The area surrounding a monarch habitat can influence monarch use of the site and survival. Land use changes have caused natural areas to be fragmented into smaller, more distant parcels of land spread throughout an ecosystem. Monarch habitat that is surrounded by natural vegetation is more beneficial to the population than habitat surrounded by development, agriculture, or other human activities.

Natural vegetation surrounding any wildlife habitat reduces the risk of danger by human contact. Milkweed habitat mixed within human inhabited areas is important for monarchs, but it can increase their risk of injury or death by vehicles or human activity, such as pesticide use. Increasing habitat in all landscapes brings monarch breeding habitats in closer proximity to one another, allowing monarchs to find suitable habitat without traveling long distances.

How to improve the value of your site

- Practice and advocate for pesticide free management in areas surrounding your site.
- If you control the land surrounding your site, work to increase the amount of natural vegetation on this land.
- Encourage surrounding area landowners to plant milkweed and nectar plants for monarchs.
- Educate surrounding area landowners about monarch conservation and environmentally friendly management practices.



4a. Percent Natural Vegetation

From the boundaries of your site, estimate the percentage of the surrounding area (within 1km or 0.6 miles) that is not pavement, gravel, lawn, crop, or buildings. Using Google Maps, draw a box around the area in question, divide it into four or more sections, and then estimate the natural vegetation coverage.

Choose one option below that best describes your site (see figures at right) Possible Score Score

	<5%	0	
	5-25 %	4	
	25-50 %	8	
	>50 %	10	
Total (Max 10):			

4b. Surrounding Milkweed and Nectar Plant Vegetation

From the boundaries of your site, identify other areas within 1km or 0.6 miles that contain milkweed or nectar plants.

Possible Score Score

Choose one	1 small or medium milkweed area	2	
	2-3 small or medium milkweed areas	4	
	1 large or extra large milkweed area	6	
	4+ milkweed areas	10	
Choose one	1-3 small - medium areas that include non-native or ornamental flowers <u>only</u>	2	
	1-3 small - medium areas that include some native flowering plants	6	
	1 or more large areas that include native flowering plants	10	
Total (Max 20):			

Introduction

Land management strategies to promote native milkweed and nectar plant growth are important to consider in monarch conservation efforts. Good land management can reduce the effects of habitat disruption and promote native growth in a habitat. Replacing non-native species with native species encourages a healthy diversity of plants and animals and provides more ecological benefits. Some management strategies important in monarch habitat conservation include prescribed burning, well-timed mowing, native seed collection, native planting, and exotic species control.

How to improve the value of your site

- Minimize pesticide use in your site and advocate for less pesticide use in areas surrounding your site. If pesticide is required for successful management, make sure to choose compounds that are less toxic (refer to the Xerces Society for more information: http://www.xerces.org/wp-content/uploads/2008/11/farming_for_bees_guidelines_xerces_society.pdf), do not apply when plants are flowering, apply using coarse sprays or ground application when possible, and avoid spraying milkweed plants.
- Plant native milkweed and/or nectar sources to improve site diversity, using plant material (seeds or plants) that are from locally grown native plants when possible.
- Plan large-scale management practices for times outside of when monarchs are present at the site (see **Appendix 3**).
- Mow up to 1/2 of the area at one time, so that milkweed is continuously available during the breeding season.
- Control woody vegetation and non-native plants to encourage milkweed and nectar plant growth.
- Water milkweed and nectar plants in drought conditions and apply organic soil amendments to optimize plant growth.

5a. Land Management - Garden

(Choose 5a, 5b OR 5c)

Choose all that apply	Possible Score	Score
No insecticide use	5	
Plant milkweed at site (3 pts), plant nectar plants at site (3 pts), or plant both (7 pts)	3 or 7	
Control woody vegetation or non-native weeds by spot treating with herbicide (2 pts), manual removal (4 pts), or both (3 pts)	2, 3 or 4	
Obtain plant materials (seeds or plants) that are from locally grown native plants	2	
Total (Max 18):		

5b. Land Management - Natural Area

Choose all that apply	Possible Score	Score
No insecticide use	5	
Plant milkweed at site (2 pts), plant nectar plants at site (2 pts) or plant both (5 pts)	2 or 5	
Control woody vegetation or non-native weeds by spot treating with herbicide (1 pts), manual removal (3 pts), or both (2 pts)	1, 2 or 3	
Mowing or burning to maintain native plants (1 pt). Mow or burn less than 1/2 of site before monarchs have arrived in the spring or after they have left in the fall (3 pts)	1 or 3	
Obtain plant materials (seeds or plants) that are from locally grown native plants	2	
Total (Max 18):		

5c. Land Management - Agricultural Area (includes pastures and sites within or surrounded by ag land)

Choose all that apply	Possible Score	Score
No insecticide use	5	
Plant milkweed at site (2 pts), plant nectar plants at site (2 pts) or plant both (4 pts)	2 or 4	
Control woody vegetation or non-native weeds by spot treating with herbicide (1 pt), manual removal (3 pts), or both (2 pts)	1, 2 or 3	
Mowing or burning to maintain native plants (1 pt). Mow or burn less than 1/2 of site before monarchs have arrived in the spring or after they have left in the fall (2 pts)	1 or 2	
Obtain plant materials (seeds or plants) that are from locally grown native plants	2	
Minimize insecticide and herbicide application to crops surrounding monarch habitat or advocate for safe/minimal application	2	
Total (Max 18):		

Section	1a	1b	2	3a	3b	4a	4b	5a	5b	5c
Maximum	10	15	25	20	15	10	20	18		
Your Score										
Section Score	of 25		of 25	of 35		of 30		of 18		
Total Score (Max 133):										

Score	
0-30	Poor monarch habitat (You'll need to do some work to attract and keep monarchs in your site, but we have lots of good ideas on how to do this!)
31-55	Fair monarch habitat (Nice start! You can make some site improvements, but monarchs are getting some benefits from your site.)
56-80	Good monarch habitat (Monarchs are definitely getting benefits from your site! You can make it even better by following a few of the instructions in this tool.)
81-95	Very good monarch habitat (Thanks for all you're doing for monarchs and other organisms. You can probably turn your site into exemplary habitat, but take some time to relax and enjoy what you've accomplished!)
96-133	Exemplary monarch habitat (You're a monarch habitat rock star! Enjoy your site, and share your expertise with others!)

How to improve the value of your site

Milkweed and Nectar Plants

- Collect and plant **native** milkweed and nectar plant seeds locally. Share seeds with friends and neighbors.
- Encourage nurseries to offer native milkweed species. Before purchasing, ask your nursery to make sure that plants have not been treated with insecticides (dangerous to larvae **and** adults).
- Add native plants to your site, or allow native species to reproduce and spread within the habitat.
- Increase native plant diversity by planting additional species.
- Cut back milkweed if you notice it is diseased (unusual color or plant structure).
- Water milkweed and nectar plants in drought conditions (if possible).

Site Characteristics and Education/Outreach

- Include signage at your site to educate others about your monarch habitat and its importance to you and to monarchs.
- Use your site as an educational tool to teach others about habitat conservation.
- Improve the diversity within your site by planting native milkweeds and/or nectar plants.
- Increase the size of your site by converting low plant diversity areas, like lawns, to monarch habitat.
- Monitor monarch eggs, larvae, and adults at the site (Refer to **Appendix 2** for monarch citizen science project websites and other resources).

Surrounding Area

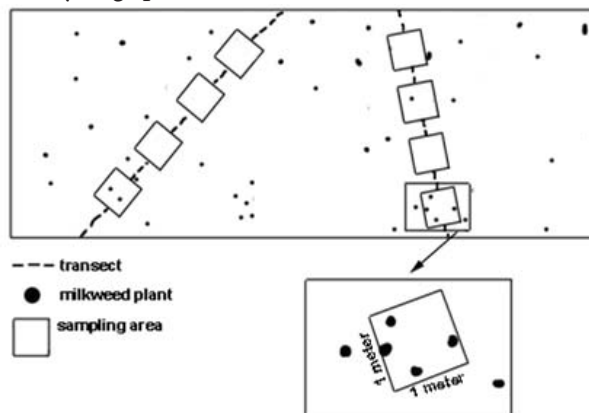
- Practice and advocate for pesticide free management in areas surrounding your site.
- If you control the land surrounding your site, work to increase the amount of natural vegetation on this land.
- Encourage surrounding area landowners to plant milkweed and nectar plants for monarchs.
- Educate surrounding area landowners about monarch conservation and environmentally friendly management practices.

Land Management

- Minimize pesticide use in your site and advocate for less pesticide use in areas surrounding your site. If pesticide is required for successful management, make sure to choose compounds that are less toxic (refer to the Xerces Society for more information: http://www.xerces.org/wp-content/uploads/2008/11/farming_for_bees_guidelines_xerces_society.pdf), do not apply when plants are flowering, apply using coarse sprays or ground application when possible, and avoid spraying milkweed plants.
- Plant native milkweed and/or nectar sources to improve site diversity, using plant material (seeds or plants) that are from locally grown native plants when possible.
- Plan large-scale management practices for times outside of when monarchs are present at the site (see **Appendix 3**).
- Mow up to 1/2 of the area at one time, so that milkweed is continuously available during the breeding season.
- Control woody vegetation and non-native plants to encourage milkweed and nectar plant growth.
- Water milkweed and nectar plants in drought conditions and apply organic soil amendments to optimize plant growth.

Guidelines for Estimating Number of Milkweed Plants

- Count milkweed plants once during the middle of the growing season. Doing it too early or too late could make the count less accurate because you may not include very small plants or plants that have senesced.
- If possible, count all milkweed plants at the site.
- If there are too many plants to count, you can estimate by collecting milkweed density samples from the site and calculating the total.
 - Randomly select several 1 square meter sample points.
 - Walk transects through the site by randomly choosing a direction to walk, stopping every 5-10 paces to delineate a 1 square meter plot. Count all milkweed plants in each plot (Note: you may get a lot of zeros, this is OK!)
 - Record for 100 sample plots and then divide by the number of square meters you sampled (100) to get a measurement of milkweeds/square meter.
 - Multiply this number by the total area of your site (in square meters) to estimate total number of milkweed plants.
 - Example: In a site that is 10,000 square meters you could count 50 milkweed plants in 100 randomly selected 1 square meter plots. 50 plants/100 sq meters equals a milkweed density of 0.5 plants/1 square meter. Then, 0.5 plants/1 square meter multiplied by 10,000 sq. meters (or total area of site) results in an estimate of 5000 milkweeds in the site. This method will work the best if milkweed is distributed throughout the site. It will not work well if there are only a few very large patches of milkweed at the site.



- The structure of milkweed plants varies from one species to the next. For species that generally have single stalks or stems, like *A. syriaca*, count each stem as one individual plant. These plants may grow in high density, very close together, but they should still be counted as individual plants. Species that grow many stalks to form a clump or cluster, like *A. tuberosa*, should be treated as one individual plant. If *A. tuberosa* has 15 stems clustered together, count this as one individual plant, rather than 15 separate ones.

Milkweed and Nectar Plant Identification Resources

- Ladybird Johnson Wildflower Center** - www.wildflower.org/collections/
- Biota of North America Program (BONAP) Native Plant Species Maps** - www.bonap.org
- Bring Back the Monarchs Milkweed Profiles (Monarch Watch)** - www.monarchwatch.org/bring-back-the-monarchs/milkweed/milkweed-profiles
- Milkweed Fact Sheet (Monarch Joint Venture)** - www.monarchjointventure.org/images/uploads/documents/MilkweedFactSheetFINAL.pdf
- Milkweed Monarchs and More Field Guide by Ba Rea, Karen Oberhauser, and Michael Quinn** - www.monarchlab.org/store/p-18-milkweed-monarchs-more.aspx
- US Forest Service Gardening for Pollinators** - www.fs.fed.us/wildflowers/pollinators/gardening.shtml
- Western Milkweed Identification Guides (Xerces Society)** - www.xerces.org/milkweedsurvey/
- Pollinator Plants of the Central US: Native Milkweeds (Xerces Society)** - www.xerces.org/milkweed/
- Pollinator Conservation Resource Center (Xerces Society)** - www.xerces.org/pollinator-resource-center
- Pollinator Partnership Planting Guides (Pollinator Partnership)** - www.pollinator.org/guides.htm



Asclepias incarnata, or swamp milkweed (above), grows singly or in clusters in wet areas.

Asclepias tuberosa, or butterfly milkweed (below), generally grows in clusters in well-drained soil.

Plant Milkweed for Monarchs

Monarchs cannot survive without milkweed. Monarch caterpillars need milkweed plants (*Asclepias* spp.) to grow and develop, and female monarch butterflies only lay their eggs on milkweed. With shifting land management practices, we have lost much milkweed from the landscape. Please plant milkweed to support monarch populations, and their incredible migration! Planting milkweed is a great way to help other pollinators too, as milkweed provides nectar resources to a diverse suite of bees and butterflies.



Dave Wendelken

Northeast Region Milkweed Species



Common Milkweed
Asclepias syriaca
Well drained soils.
Photo by Louis-M. Landry



Swamp Milkweed
Asclepias incarnata
Damp, marshy areas.
Photo by Janet Allen



Butterfly Weed
Asclepias tuberosa
Well drained soils.
Photo by Thomas Muller, Lady Bird Johnson Wildflower Center



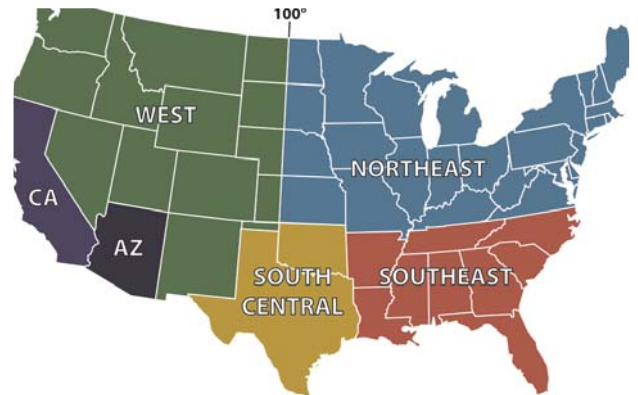
Whorled Milkweed
Asclepias verticillata
Prairies and open areas.
Photo © Kim Davis & Mike Stangeland



Poke Milkweed
Asclepias exaltata
Woodland areas (except in NE, KS, MO, ND & SD).
Photo by David Smith

Milkweed Regions

There are many native milkweed species in each of the six “Milkweed Regions” shown on this map. The species highlighted are known to be used by monarchs, and are easy to establish. Please try to find plants grown as close as possible to where you’ll be planting them, and from the closest possible seed source.



South Central Region Milkweed Species



Green Antelopehorn Milkweed
Asclepias viridis
Dry areas and prairies. Also known as green milkweed.
Photo by Harlen Aschen



Antelopehorns Milkweed
Asclepias asperula
Desert and sandy areas.
Photo by Kip Kiphart



Zizotes Milkweed
Asclepias oenotheroides
Sandy/rocky prairies and fields.
Photo by Jennifer Kleinrichert

Southeast Region Milkweed Species



Butterfly Weed

Asclepias tuberosa

Well drained soils.

Photo by Thomas Muller, Lady Bird Johnson Wildflower Center



Whorled Milkweed

Asclepias verticillata

Prairies and open areas.

Photo © Kim Davis & Mike Stangeland



White Milkweed

Asclepias variegata

Thickets and Woodlands.

Photo by Melton Wiggins



Aquatic Milkweed

Asclepias perennis

Hydrated soils.

Photo © Kim Davis & Mike Stangeland



Sandhill/Pinewoods Milkweed

Asclepias humistrata

For use in some regions of FL. Dry sandy areas and soils.

Photo © Kim Davis and Mike Stangeland

Western Region Milkweed Species

NOTE: Excludes California and Arizona; see below for those regions.



Mexican Whorled Milkweed

Asclepias fascicularis

Dry climates and plains, except in CO, UT, NM & AZ.

Photo by Christopher Christie



Showy Milkweed

Asclepias speciosa

Savannahs and prairies.

Photo by Robert Potts © California Academy of Sciences

Selecting and Finding Milkweed Plants

While any of the species listed here can be grown in garden settings, please use species that are native to your county for larger restoration projects. You can find more information about milkweed, together with a directory of native plant vendors that sell milkweed plants and seeds, on our website:

www.plantmilkweed.org

Arizona Milkweed Species



Butterfly Weed

Asclepias tuberosa

Well drained soils.

Photo by Gail Morris



Antelopehorns Milkweed

Asclepias asperula

Desert and sandy areas.

Photo by Kip Kiphart



Rush Milkweed

Asclepias subulata

Desert areas.

Photo by Gail Morris



Arizona Milkweed

Asclepias angustifolia

Riparian areas and canyons.

Photo by Morris Family

California Milkweed Species



Mexican Whorled Milkweed

Asclepias fascicularis

Dry climates and plains.

Photo by Christopher Christie



Showy Milkweed

Asclepias speciosa

Savannahs and prairies.

Photo by Robert Potts © California Academy of Sciences



Desert Milkweed

Asclepias erosa

Desert regions.

Photo by Christopher Christie



California Milkweed

Asclepias californica

Grassy areas.

Photo by Christopher Christie



Heartleaf Milkweed

Asclepias cordifolia

Rocky slopes.

Photo by Dee E. Warena



Woolly Milkweed

Asclepias vestita

Dry deserts and plains.

Photo © 2010 Neal Kramer



Woolly Pod Milkweed

Asclepias eriocarpa

Clay soils and dry areas.

Photo by Br. Alfred Brousseau, St. Mary's College



MONARCH
JOINT VENTURE



INTERNATIONAL PROGRAMS
US Forest Service, Department of Agriculture

*Common names vary from place to place, so we have used the USDA names for consistency.

Site Delineation Guidelines

- We define a monarch habitat site as the whole area in which milkweed and nectar plants grow. If, for example, there is a large patch of milkweed that grows around a pond in the middle of a prairie area with scattered milkweed, the site should be defined as the entire prairie area rather than just the pond where milkweed grows.
- If the site is small enough, measure and record the dimensions of the site to the best of your ability, then calculate the area using the appropriate area formula.
- For sites that are too large to measure, or are an unusual shape, use an area calculation tool (example: www.daftlogic.com/projects-google-maps-area-calculator-tool.htm) to identify the boundaries and calculate the area for your site. You may need to walk the perimeter of your site to determine where the boundaries would be on a map.

Citizen Science Projects

There are many citizen science projects that focus on monarchs, and local, state, and national projects that focus on butterflies in general. Here we list only nation- or continent-wide projects. For more information, see www.monarchjointventure.org and www.monarchnet.org.

- **Monarch Larva Monitoring Project:** Volunteers collect weekly monitoring data on monarch egg and larval densities in monarch breeding habitats, and estimate rates of parasitism and monarch survival. www.mlmp.org
- **Journey North:** Volunteers report adult monarch sightings during the spring and fall migrations, and report the first signs of monarch eggs and milkweed in their area. www.learner.org/jnorth/monarch/index.html
- **Monarch Watch:** Volunteers help determine migratory pathways and survival of migratory monarchs by tagging adult monarchs during the fall migration, and can register monarch habitats as certified Monarch Waystations. www.monarchwatch.org/
- **Project Monarch Health:** Volunteers sample abdomens of adult monarchs that they raise for a protozoan parasite of monarchs and send the samples to the University of Georgia for processing. www.monarchparasites.org/
- **North American Butterfly Association Counts:** Volunteers participate in local butterfly counts where they spot, identify, and record the number of each species that they find in a 15-mile diameter plot over the course of one day. www.naba.org
- **Southwest Monarch Study:** Volunteers track the migration and breeding patterns of monarchs in the southwestern U.S., most notably Arizona. www.swmonarchs.org
- **Monarch Net:** The North American network of monarch butterfly monitoring programs. www.monarchnet.org



Other Monarch Resources

- **Monarch Joint Venture**—www.monarchjointventure.org
- **University of Minnesota Monarch Lab**—www.monarchlab.org
- **US Forest Service, The Monarch Butterfly in North America**—www.fs.fed.us/wildflowers/pollinators/monarchbutterfly/
- **The Xerces Society for Invertebrate Conservation**—www.xerces.org/
Monarch page—www.xerces.org/monarchs or www.xerces.org/western-monarchs
Milkweed page—www.xerces.org/milkweed
Pollinator Habitat Assessment Guide—www.xerces.org/wp-content/uploads/2009/11/PollinatorHabitatAssessment.pdf
- **Monarch Alert**—www.monarchalert.calpoly.edu
- **Monarch Butterfly Fund**—www.monarchbutterflyfund.org
- **Wild Ones, Wild for Monarchs Campaign**—www.wildones.org/land/monarchs
- **Pollinator Partnership**—www.pollinator.org
- **Monarch Watch or Bring Back the Monarchs Campaign**—www.monarchwatch.org/bring-back-the-monarchs or www.monarchwatch.org

Monarch Phenology

All large-scale land management activities that remove vegetation (like mowing or burning) should occur outside of the time when monarchs are present. To create a habitat best suited for monarchs, make sure that there are native nectar plants available throughout the time that monarchs are present, including the summer breeding period, and the spring and fall migrations. To help you plan the timing of management activities, here are descriptions of eastern and western monarch phenologies, or the timing of their annual life cycle events. The Monarch Lab website has more detailed information (www.monarchlab.org/Lab/Biology/AnnualLifeCycle/).

Eastern Population: Decreasing day length and temperatures, along with aging host plants and nectar sources trigger a change in monarchs; this change signifies the beginning of the migratory generation. Unlike summer generations that live for two to six weeks, the migratory generation can live for up to nine months. Most monarchs that emerge as adults after about mid-

August in the eastern U.S. enter reproductive diapause (put reproduction on hold until later), and begin to migrate south in search of the overwintering grounds where they have never been before. They use nectar plants (and some that are not in diapause lay eggs on milkweed plants) during this southward migration. They find south-southwest facing slopes in the high elevation oyamel fir forests of central Mexico, arriving beginning in early November. In March, this generation begins the journey north into Texas and southern states, laying eggs and nectaring as they migrate and breed. The first generation offspring from the overwintering population continue the journey from the southern U.S. to recolonize the eastern breeding grounds, migrating north through the central latitudes in approximately late April through May. Second and third generations reproduce in the northern breeding grounds throughout the summer. It is generally the fourth generation that begins where we started this paragraph, migrating through the central and southern U.S. and northern Mexico to the wintering sites in central Mexico.

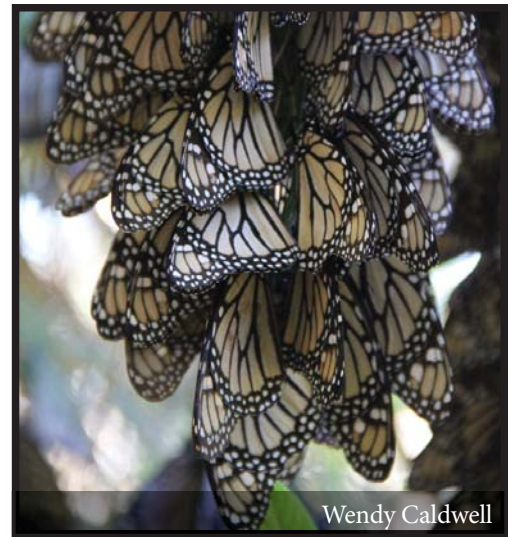
Western Population: Western monarchs gather to roost in eucalyptus, Monterey cypress, Monterey pine, and other trees in groves along the Pacific coastline of California, arriving beginning in late October. The colonies generally break up slightly earlier than those in Mexico, with dispersal generally beginning in mid-February. Less is known about the timing and location of breeding and migratory movement in the western U.S., but milkweed and nectar plant availability throughout the spring, summer and fall will benefit western monarchs, especially in California, Nevada, Idaho, and Oregon, states that appear to be important sources of western monarchs. In areas of the desert southwest, monarchs use nectar and milkweed plants throughout much of the year.

Land Management Resources

- **North American Monarch Conservation Plan**— www.monarchjointventure.org/resources/publications/
- **USDA Natural Resources Conservation Service**—www.nrcs.usda.gov
- **Department of Natural Resources**— state specific
- **Soil and Water Conservation Districts**—local level
- **Bring Back the Monarchs, Harvesting Milkweed**—www.monarchwatch.org/bring-back-the-monarchs/resources/harvesting-milkweed
- **Bring Back the Monarchs, Milkweed Suppliers**—www.monarchwatch.org/bring-back-the-monarchs/resources/plant-seed-suppliers
- **The Xerces Society**—www.xerces.org/milkweed



Land management practices, such as the summer burning that occurred in the Oklahoma pasture pictured here, can help monarchs if they occur during periods of monarch absence. Photo of female ovipositing on new *Asclepias viridis* growth by Kristen Baum.



Wendy Caldwell