Building a New "MONARCH-y" in Will County

A guide to installation of a monarch habitat

Produced by the University of Illinois Extension
Will County Master Naturalists and
Will County Master Gardeners

What is the problem?

"According to scientists, the continent's monarch population has declined by more than 80 percent from its average during the past two decades—and by more than 90 per cent from its peak of nearly one billion butterflies in the mid -1900s." (National Wildlife Federation, April/May 2015) There are several reasons that have been identified as causes of this precipitous decline, including global warming, loss of over-wintering habitat, and overuse of pesticides. While these are large-scale problems that will require long-term solutions, there are two specific solutions that Will County residents can effect: 1) creating monarch-friendly habitats that includes milkweed, and 2) petitioning local officials to curtail mowing and pesticide spraying.

The purpose of this project is to guide Will County residents in the creation and maintenance of monarch-friendly habitats. While this document is not intended to be a definitive guide on monarch habitat, it designed to provide information that can improve the local ecosystem and help citizens establish pollinator habitats appropriate for conditions in Will County.

What are the basics of building a monarch-friendly habitat?

- A sunny location is a must; eight hours of sunshine are recommended.
- Average garden soil will work. Amend the soil with organic matter/compost if desired.
- Good drainage is necessary. The area should not have persistent standing water.
- Access to a source for watering is critical, especially during the first-year establishment and times of drought.
- Select plant material appropriate for 1) the site, and 2) the goals of the habitat. (*See detailed information on pp. 3-7.*)

How do you prepare the site?

Depending on where you intend to install your monarch habitat garden, there are some things to consider up front. If you already have a garden in full sun, you can simply incorporate essential host and nectar plants into the existing garden. If, however, the planned site is covered with grass, the grass must be removed. There are several ways this can be accomplished, once you lay out the general size and shape you want for the monarch garden/habitat:

- Cover the grass with several layers of moistened newspaper, then cover with a layer of mulch about four inches deep. After a few weeks, the grass should be killed from lack of sun, and the newspaper will begin to biodegrade.
- Solarize the soil by covering it with a clear, heavy-duty plastic tarp for four weeks or more during the hottest part of the year. This method not only kills grass and weeds, but it can also improve soil structure, increase nitrogen availability, and reduce some species of nematodes and soil borne diseases. Complete instructions on solarizing the soil can be found on line at *ucanr.edu/sites/YCMG/files/187332.pdf.*
- If you choose to apply an herbicide (like glyphosate) labeled for killing grass, make sure to read and follow **all** label directions. Do **not** use a 'super' or 'max' version of herbicide with a long-term residual effect. Check to see how long you must wait after the application before you can begin planting.

Once the grass is removed, you can amend the soil if it is extremely poor or heavy clay. Generally, native milkweed and other native plants do not require soil amendments.

What should you plant?

First and foremost, the plant that you should include in your monarch habitat is milkweed. Milkweed (*Asclepius*) is the only plant family that monarchs use as a host plant. That means that monarchs will lay their eggs only on milkweed plants. There are several different varieties of milkweed that are native to Will County, but not all are commonly available commercially. As a result, you may have to start some of your milkweed from seed. In addition to what you may find at your local nursery, seed and plant sources can be found on the internet.

Secondly, you should plant a variety of flowering plants on which adult monarchs can feed (nectar). Suggestions for both perennial and annual flowering plants that monarchs prefer are listed on the following pages. Selections do not need to be limited to the recommendations given. However, do not assume that just any flowering plant is a nectar source for monarchs. In recent years, many nurseries have begun to advertise plants that attract butterflies. This may help in choosing additional plant material; however, keep in mind that different butterflies like different plants.

When planning your garden, choose plants that are not only appropriate for the full-sun location, but also the size of the garden and its moisture level. Start with perennial plants, as they will be the "bones" of your habitat and will remain in place for many years. If your garden is large enough, you may opt to include a few native shrubs and native grasses.

Your habitat garden will take some time to mature. While it is maturing, you can add annual flowers to fill in some of the spaces. Even when the garden reaches maturity, you can plan on using annuals each year. Annuals will generally provide a season-long nectar source for monarchs.

Plan your garden so that it offers a variety of blooms as a nectar source for monarchs from late May until September. Deadheading (removing spent blooms) will encourage the production of fresh blooms. Annuals and perennials 'play together' nicely in the garden. Since perennials have a shorter bloom period, annuals can furnish nectar when the perennials are not blooming.

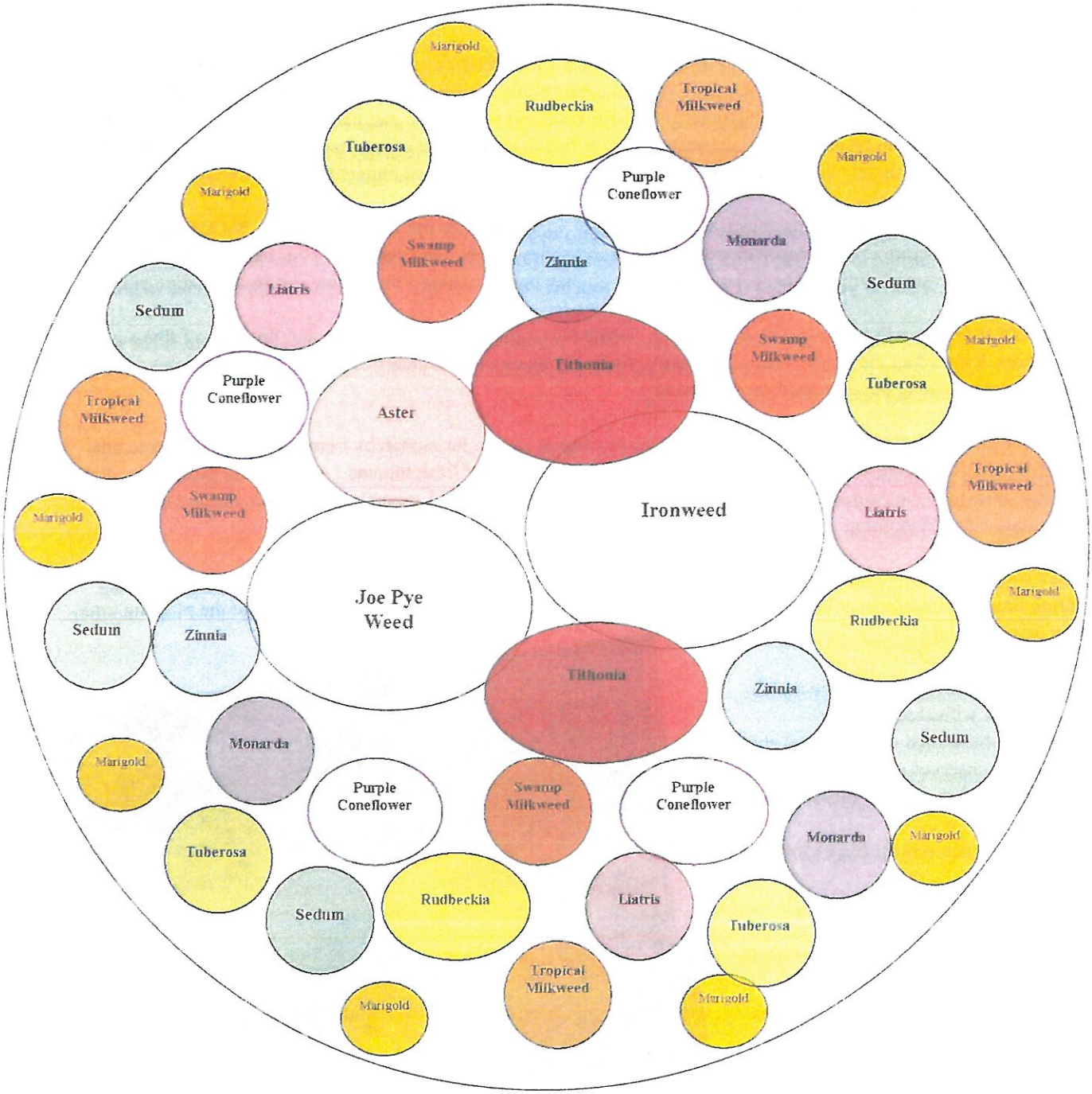
Make sure that you give the plants a good soaking at planting time, and water regularly thereafter. Extra watering during times of drought may be necessary. An application of a time-released fertilizer in the bed at the planting time may be beneficial.

It is also recommended that you mulch your habitat with about 2" of a biodegradable mulch such as wood chips. Mulching conserves moisture, moderates soil temperatures, and inhibits weeds.

A sample garden project can be found on the next page.

This sample monarch habitat garden is based on a 10-foot-diameter round bed. It is also based on full sun with no large structures or trees/shrubs nearby.

This planting uses many of the recommended monarch milkweeds, perennials, and annuals found on the next pages. Plants chosen are fairly similar in their moisture requirements. While many of these plants may prefer a wetter or drier soil, they will all do well in medium soil conditions. Heights will vary depending on soil and moisture conditions.



Milkweed (*Asclepius*)

The backbone of your monarch habitat will be milkweeds. While there are many, we have chosen these four, based on their importance and likely availability for purchase. Note that many milkweeds are available only as seed.

Asclepius tuberosa - Butterfly weed
Perennial in zones 3-9
Height: 1-2 feet
Spread: 1 foot
Blooms: June - August
Soil moisture: prefers dry soils

Note that this milkweed does **not** produce the milky sap that contains the toxins that monarchs use for protection against predation by birds.

Asclepius incarnata - Swamp milkweed
Perennial in zones 3-9
Height: 2-5 feet
Spread: 1 foot
Blooms: late summer
Soil moisture: requires moist soils

Plants tend to bloom twice in a growing season in garden settings. In gardens, most plants live two to five years; however some are known to survive up to 20 years.

Asclepius sullivantii - Prairie milkweed
Perennial in zones 3-7
Height: 2-4 feet
Spread: 1-2 feet
Blooms: June-July
Soil moisture: medium to wet

This milkweed is showy and fragrant. It is an excellent milkweed not only as larval food, but also a nectar source for adult monarchs.

Asclepius curassavica - Tropical milkweed
Perennial in zones 8a-11; annual in Illinois
Height: 2-3 feet
Spread: 1-2 feet
Blooms: varies; dependent on purchased plants versus starting from seed
Soil moisture: dry to medium

A favorite of monarchs, this plant is good for raising caterpillars. Not native to North America, it should be cut down in September. Research is on-going about the advisability of having this plant in the garden.

Perennials for Adult Monarchs

Perennials (*plants that live for more than one growing season*) are essential in your monarch habitat, because their flowers provide nectar to feed adult butterflies. Listed below are some known to be popular with adult monarchs. Local garden centers will offer more perennials that monarchs use as nectar sources.

Echinacea purpurea - Purple coneflower
Perennial in zones 3-8
Height: 2-4 feet
Spread: 1.5 - 2 feet
Blooms: June to August
Soil moisture: medium

Divide clumps when they become overcrowded (about every four years). Plants usually re-bloom without deadheading; however, prompt removal of spent flowers improves general appearance. Plants freely self-seed if at least some of the seed heads are left in place.

Liatris - Blazing star
Perennial in zones 3-8
Height: 2-4 feet (Some varieties can get as tall as 6 feet.)
Spread: 1 foot
Blooms: July to August
Soil moisture: medium

There are many different varieties of *Liatris* that are native to Will County. Any of the native *Liatris* are recommended. *Liatris spicata* is the variety most commonly found in local nurseries.

Eupatorium fistulosum - Joe Pye weed
Perennial in zones 4-8
Height: 4-7 feet
Spread: 2-3 feet
Blooms: July to September
Soil moisture: wet to medium

Several varieties are available, including a shorter version know as *Eupatorium dubium* 'Little Joe'. This is a large specimen plant that should be put at the back of your planting (or in the center of a free-standing circle/oval bed).

Veronia fasciculata - Ironweed
Perennial in zones 4-8
Height: 5-6 feet
Spread: 1-2 feet
Blooms: July to September
Soil moisture: medium

This is a large specimen plant native to Will County. It has bright purple blooms, which tend to appear in late July to August. It has the same planting recommendations as those listed above for Joe Pye weed.

Perennials for Adult Monarchs *(continued)*

Monarda fistulosa - Bee balm/Wild bergamot
Perennial zones 3-9
Height: 2-4 feet
Spread: 1-2 feet
Blooms: Late June to August
Moisture: Medium

Native *Monarda* plants have fewer problems with powdery mildew than most of the cultivars. All *Monarda* benefit from good air circulation.

Asteraceae - Aster
There are many varieties of aster; most are perennial in Will County.
Height: 2-5 feet - dependent on variety
Spread: 1-3 feet
Blooms: August to September
Moisture: medium

Asteraceae is one of the largest plant families, and many choices are available. Choose a variety based on the overall design, garden size, and site conditions.

Sedum spectabile—Sedum
Perennial in zones 3-9
Height: 1.5—2 feet
Spread: 1.5 to 2 feet
Blooms: August to September
Moisture: medium to dry

Sedums are low-maintenance plants that are great additions to the monarch habitat. They are low-growing, late-season bloomers.

Rudbeckia hirta—Black-eyed Susan
Perennial in zones 3-7
Height: 2-3 feet
Spread: 1 to 2 feet
Blooms: June to September—dependent on variety
Moisture: medium

Rudbeckia hirta is a biennial or short-lived perennial that can reseed. Often grown as an annual, it blooms from seed the first year. Several cultivars are available. Note that 'Goldstrum' can be a bit invasive.

Annuals for Adult Monarchs

Annuals (*plants that go through their entire life cycle in one growing season*) are essential in your monarch habitat because they supply nectar for adult butterflies, often bridging perennial bloom times. Listed below are some annuals known to be popular with monarchs, but you can check for more monarch nectaring plants at garden centers.

Zinnia elegans - Zinnia

Height: 1-4 feet (dependent on variety)

Spread: 1-2 feet

Blooms: all summer

Moisture: average

Planting zinnias on the outer edges of garden will increase air circulation and help control powdery mildew. Water the surface of the soil beneath the plant. Avoid wetting the plant itself.

Tithonia - Mexican sunflower

Height: 3-6 feet

Spread: 2-3 feet

Blooms: late July to frost

Moisture: average

Tithonia is generally not found in nurseries, but it may be started from seed. It requires very warm temperatures. Do not start seed too early, and do not set out plants until temperatures are above 70 degrees.

Pentas lanceolata - Pentas

Height: variable *(Check the variety being purchased.)*

Spread: variable

Blooms: all summer until frost

Moisture: moist, well-drained soil

Pentas blooms all summer long, even during the hottest weather. It has large clusters of starry blooms that attract butterflies by the dozens, as well as hummingbirds.

Tagetes - Marigolds

Height: 6 inches to 3 feet—dependent on variety

Spread: 1-2 feet

Blooms: all summer until frost

Moisture: medium

Garden centers generally offer a variety of marigolds already in bloom in early spring. Plant after all danger of frost has passed, and deadhead frequently to keep the plant producing fresh blossoms. Choose the short French varieties.

What are the basic planting instructions?

- Make sure plants are moist before removing from container.
- Gently tease apart the roots on the sides and bottom to encourage healthy growth.
- Dig a hole the same depth as the root ball and slightly wider so that roots can readily grow.
- If amending the hole, add compost to the soil dug out of the hole and mix the two together.
- Place the plant in the hole, keeping the crown at soil level. The crown is the point
  - ➡ where the stem meets the roots.
  - ➡ Planting too deeply can cause the plant to rot and die.
    Planting too shallowly can result in desiccation (drying out), stress, and death.
- Fill the hole half full with the soil or soil-and-compost mix and water gently.
- Add the remaining soil or soil-and-compost mix up to the crown level. Gently water in.
- Use a gentle spray nozzle, not a forceful jet spray.
- Do **not** tamp or compact the soil.

How do you maintain the habitat?

Watering

- Regular watering, especially during the first year, is critical. Plants need the equivalent of 1" of rainfall per week.
- Use a simple rain gauge to measure rainfall; don't guess!
- In especially windy and/or dry areas, and during times of drought, more frequent watering may be needed.
- Avoid late/evening watering and overhead watering to reduce chances of diseases.

Weeds

- Monitor the garden/habitat regularly for weeds. Pull/dig weeds as soon as they appear. They are much easier to remove **before** they become established.
- Do not use chemicals to do what your hands and a good tool can accomplish easily.
- If a natural edge is used, keep the outline of the garden crisp and neat using a hoe, shovel, or other tool to maintain a small trenched edge.
- For a neater look, remove spent flower blooms. Some plants will reward you with more flowers after this deadheading.
- You may elect to let some flowers go to seed, providing a valuable food source for birds.

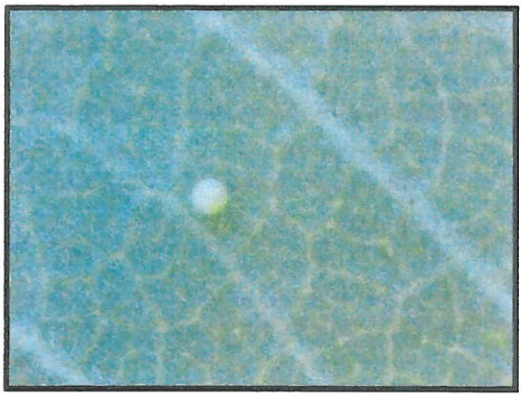
Dealing with problems

The majority of problems will require **little or no action**; some will even be fun and educational to observe. The Master Gardener volunteer teams will help identify problems and explain what action should be taken. Some common problems that you are likely to see include these:

- *Powdery mildew* is a common fungal disease characterized by white to grayish powdery spots of the leaves and stems of plants.
- *Small milkweed bugs* (*Lygaeus kalmii*) and *large milkweed bugs* (*Oncopeltus fascia)* are more a nuisance than a threat. They feed on milkweed leaves, stems, and seed pods. With their bright colors, they are a visual delight.
- *Aphids* are tiny, soft-bodied insects that feed night and day on plant sap. A gregarious lot usually found in populous colonies, they come in green, red, black, and brown and colors. They can carry viruses from one plant to another.

Raising Caterpillars

Starting your own monarch habitat has special rewards. In addition to enjoying the satisfaction of helping secure the future of migrating monarch populations, you can also experience the miracle of metamorphosis first-hand by raising caterpillars.



The first step in raising caterpillars is finding eggs. Small, roundish, and off-white, the eggs are generally 1.2 mm high and .9 mm wide. To find eggs, check the underside of the leaves of your milkweed plants often. Monarch eggs do not remain in egg form for long. In only three to five days, the egg will hatch into a caterpillar. To ensure that the larvae have enough food, monarchs usually lay only one egg per milkweed plant. They generally prefer younger plants with tender leaves.

When you find a leaf with an egg on it, gently cut off the stem with the leaf and put it in water. Floral vials filled with water as shown in the photo on the left or a small soda bottle with the top covered with foil are suitable water holders for the cutting. While an exposed water surface is not a concern at the egg stage, that changes when the egg hatches into a caterpillar. If the water surface is not covered, caterpillars can drop into the water and drown.

After the egg hatches into a caterpillar, it spends the next 10 to14 days doing two things: voraciously eating milkweed leaves and pooping. Since the caterpillars do not generally wander from their food source, putting them into a container is not really necessary. However, many enthusiasts choose to put the caterpillars in an enclosure with netting on top. The caterpillars in these photos were placed in an aquarium. A sheet of screening held in place with binder clips covers the top. In this set-up, the enthusiast can "watch the show" through the clear glass. The screening provides an excellent anchoring place to which the chrysalis can attach itself.

If, after careful examination, you can't find any eggs on your milkweed plants, look for holes and damage on the milkweed leaves . Although you may have missed the egg stage, checking out evidence of chewing on the leaves may help you find a caterpillar that has already emerged.

Follow the same procedure described for the egg stage: gently cut the stem with the leaf attached, and place it in a suitable container with water. Cover the surface of the water to prevent drowning in case the caterpillars fall.

During the 10 to14 days the monarch is in larval (caterpillar) form, you must do two things: 1) provide a fresh supply of milkweed, and 2) clean the container of all frass (poop). Leaving the frass in the container can lead to disease, so keep it clean. Handle the caterpillars as little as possible, because they can be fragile.

Raising Caterpillars *(continued)*

When the caterpillar becomes too large for its skin, it molts, or sheds its skin. The intervals between molts are called instars. Monarchs go through five instars. The approximate body length grows with each instar: 2-6mm (first); 6-9mm(second); 10-14mm (third); 13-25mm (fourth); and 25-45mm(fifth and final).

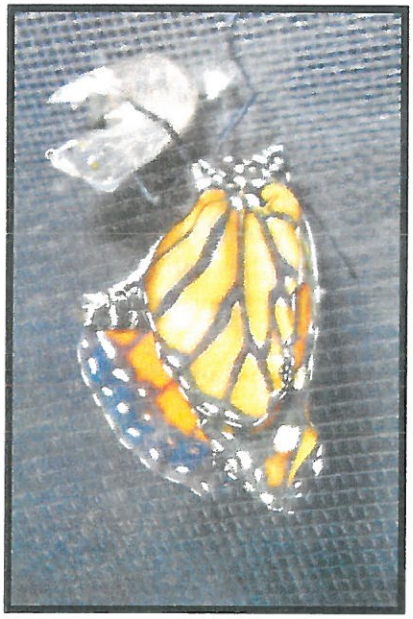
When the caterpillar is ready to transform itself into a chrysalis, it stops eating and looks for a place to pupate. When it finds a suitable place, it spins a silken web to attach itself securely to its chosen location. As noted earlier, a piece of screening on top of an old aquarium can provide an ideal place for pupation.

Once the caterpillar is firmly attached, it will form a pre-pupal "J" before shedding its skin for the last time (*photo on right*). When its tentacles hang very limply and its body straightens out a little, the final shedding is imminent; it will happen within minutes.

At this point, the caterpillar undergoes a series of form changes until the final creamy-green color of the chrysalis is achieved. Note that a chrysalis that shows a black area is likely to be diseased.

As metamorphosis continues, the chrysalis starts to become transparent, allowing you to see the adult monarch inside. When fully developed, the adult monarch will break free of the chrysalis and begin to unfold and inflate its wings. Once fully inflated, the wings will take approximately four hours to dry and harden. Do not handle the monarch until the wings are fully dried and hardened; always handle by all four wings.

We recommend that you release your monarch immediately, so that it can make its way to a nectar source to feed. In preparing for the release, bear in mind that monarchs can not fly unless the temperatures are above 60 degrees.



More about Monarchs

http://www.pollinator.org/resources.htm
Scroll down to Home Garden resources at this site, and check out articles like *"How to Build a Pollinator Garden," "Pollinator Friendly Practices,"* and *"Monarch Larval Food: Swamp Milkweed."*

http://monarchbutterflygarden.net/milkweed-plant-seed-resources/
See beautiful photos of different milkweeds, including a dozen native to Illinois. Read a brief description of an assortment of milkweeds and their native ranges. Link to sources for seeds and plants.

http://www.monarchjourney.com/index.php/info/comments/fun_facts_about_the_monarch_butterfly_and_caterpillar/
Read a short list of fun facts about monarchs. Interesting for children and adults alike.

http://www.defenders.org/monarch-butterfly/basic-facts
Read an overview of the monarchs' diet, populations, migration, and behaviors. The site offers a brief discussion about threats to monarchs, as well as some steps that have been taken to help them.

http://monarchwatch.org/blog/2009/04/15/monarch-butterfly-top-ten-facts/
Written Dr. Oley R. "Chip" Taylor, Director of Monarch Watch, this list of quick facts will whet your appetite for more.

http://www.bbc.co.uk/nature/life/Monarch_(butterfly)
View a narrated video of the monarch's "long-haul" migration to Mexico for winter hibernation.

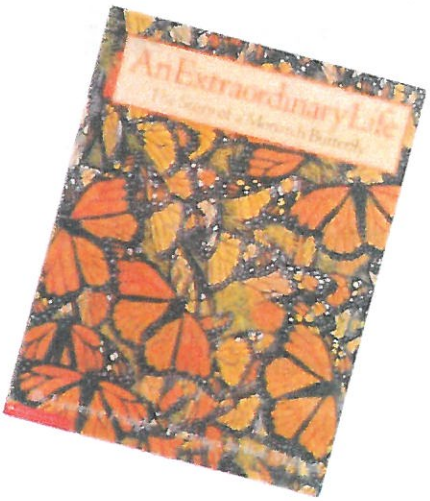
http://monarchwatch.org/press/press-briefing.html
Check this site out for some of the best, most comprehensive information about monarchs, including migration, reproductive diapause, mating, over-wintering in Mexico, clustering, breeding system, threats to migration, and things that need to be done to help monarchs. Written Dr. Orley R. "Chip" Taylor, Director of Monarch Watch.

http://www.monarch-butterfly.com/monarch-butterflies-facts.html
Enjoy an excellent, easy-to-read presentation of information about monarchs, including detailed information about the various life stages, mating, anatomy, and migration.

http://www.nwf.org/News-and-Magazines/National-Wildlife/Animals/Archives/2008/Restoring-Rare-Beauties.aspx
An in-depth article written with input from scientists who have watched as not only the monarch, but dozens of butterflies native to the U.S. , have begun to decline or disappear. Historical trends and causes for the decline are covered.

Want to learn how to start plants from seeds? Check out these helpful websites:
http://www.organicgardening.com/learn-and-grow/starting-seeds-indoors?page=0,1
http://www.organicgardening.com/learn-and-grow/14-tips-starting-your-own-seeds?page=0,1
http://www.gardeners.com/how-to/how-to-start-seeds/5062.html
http://www.almanac.com/content/transplanting-your-seedlings
http://www.finegardening.com/10-seed-starting-tips (great how-to photos)
http://aggie-horticulture.tamu.edu/newsletters/hortupdate/hortupdate_archives/2002/may02/art2may.html

Spread your wings and fly!
Learn more from these fun resources for children.



An Extraordinary Life: The Story of a Monarch Butterfly, Laurence Pringle and Bob Marstall
Are You a Butterfly? (*A Backyard Books*), Judy Allen
Backyards and Butterflies: Ways to Include Children With Disabilities in Outdoor Activities, Doreen Greenstein
Becoming Butterflies, Anne Rockwell and Megan Halsey
Butterflies (*Fascinating Nature Series*), Dan Ashton
Butterflies (*First Discovery Book*), Claude Delafosse and Gallimard Jeunesse
Butterflies! (*Know-It-Alls*), Darlene Freeman
Butterflies and Caterpillars.: A Kids Book of Fun Facts and Photos on the Life Cycle of the Butterfly (*Kids Look and Learn Books, Volume 1*), Amanda Ollier
Butterflies and Moths (*A Golden Guide*), Robert T. Mitchell and Herbert S. Zim
Butterflies for Kids: Amazing Animal Books For Young Readers, Valeria Arcas
Butterflies in the Garden, Carol Lerner (illustrator)
Butterfly Activity Book, Patricia J. Wynne
Butterfly Alphabet Book, Brian Cassie and Jerry Pallotta
Clara Caterpillar, Pamela Duncan Edwards
Crinkleroot's Guide to Knowing Butterflies & Moths, Jim Arnosky
From Caterpillar to Butterfly (*Let's-Read-and-Find-Out Science, Stage 1*), Deborah Heiligman
How to Raise Monarch Butterflies: A Step-by-Step Guide for Kids (*How It Works*), Carol Pasternak
La Mariposa, Francisco Jimenez
Luna, The Night Butterfly (*Fun Rhyming Children's Books*), Lily Lexington
Madame's Journey Home, Mariosa Antwan
Monarch and Milkweed, Helen Frost and Leonid Gore
Monarch Butterfly, Gail Gibbons
Monarch Butterfly of Aster Way, Elizabeth Ring
Monarch Magic, Betty Hall
Monarch Magic! Lynn M. Rosenblatt
My, Oh My--A Butterfly! All About Butterflies (*Cat in the Hat's Learning Library*), Tish Rabe
Caterpillar to Butterfly (*National Geographic Readers*), Laura Marsh
Great Migrations Butterflies (*National Geographic Readers*), Laura Marsh
Small Worlds of Bees and Trees and Butterfly Knees (*A Book of Classic Poetry for Children: Nature with a Touch of Whimsy, Volume 4*), TJ Denby
Story of the Butterfly Children, Sibylle von Olfers
The Butterfly Book: A Kid's Guide to Attracting, Raising, and Keeping Butterflies, Kersten Hamilton
The Butterfly House, Eve Bunting and Greg Shed
The Life Cycles of Butterflies: From Egg to Maturity, Judy Burris and Wayne Richards
The Life Cycle of a Butterfly (*The Life Cycle Series*), Bobbie Kalman
The Very Hungry Caterpillar, Eric Carle

Organization

Want to add something fun to the habitat?

Monarchs get sugar from nectar plants. In addition to sugar, they need salt and amino acids. They get this from sipping on moist sand or soil, fluids in dung, and even carrion. This 'sipping' behavior is called puddling or mud-puddling. It is usually observed more in males than in females. Research suggests that males ingest needed salts and minerals during puddling. They are absorbed into the male's sperm and transferred to the female during mating. Research also suggests that the nutrients absorbed by the females result in more viable eggs.

Watch this behavior in your monarch garden. Put a shallow container in the garden. Fill it with coarse sand and add enough water to thoroughly moisten the contents. Don't fill it with water. You want a puddle, not a swimming pool! You can also add some small stones. The stones should not be totally submerged. Keep the contents moist. Wait and watch. You may see not only monarchs, but other butterflies as well.

Experts from Clemson University note that a mix of one gallon of sand and 1/2 to 3/4 cup of table salt or rock salt can be used in the puddling container. Some gardeners have had more puddling activity when they initially placed a 'decoy', such as an artificial butterfly, on the container. You may be lucky enough to observe several butterflies, or a puddling cluster, visiting the container. If you do, share your photos with us!

Photo credits

Chris Blecker
Sandy Crowl
Robert Hamilton
Home Depot Garden Center
Monarch Watch
Monarch Guide
Phyllis Schulte
Kim Witkowski