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Photo by Tanya Harvey



Photo courtesy of USDA NRCS



The **monarch butterfly** (*Danaus plexippus*) is among the most recognized, studied, and loved of all of North America's insects. Children study monarchs in school. Researchers and citizen scientists track their migration and breeding. Conservationists and government agencies are concerned about threats to breeding, migration, and wintering habitats.

The annual migration cycle of the monarch butterfly has been described as the most spectacular in the insect world. It has also been deemed an "endangered natural phenomenon." This species and its migration are dependent upon conservation of habitats in all three North American countries—Canada, the United States, and Mexico.

Awareness of the monarch butterfly's life cycle and habitat requirements is essential for their survival and an important step in the conservation of this animal. Many government agencies, organizations, and individuals across North America are working on projects to conserve monarch habitats and their migration.

### *Monarch Butterfly Biology*

#### **Life Cycle**

The monarch butterfly, like other insects, has several life forms and stages prior to reaching adulthood. The monarch has four distinct life stages: egg, larva (caterpillar), pupa (chrysalis), and adult.



#### **The Migrating Generation**

During the summer breeding season, monarchs live from

the native plants they depend upon. They did so willingly. Now it is your turn to carry the torch, to pass along the knowledge and passion needed to keep our monarch butterflies and their habitats thriving. Your enthusiasm will be catching.

- Invite your family and friends along for a walk through a wildflower meadow and keep an eye out for monarch butterflies, larvae, and even those tiny monarch eggs.
- Learn the milkweeds native to your area.
- Volunteer to make a presentation in your town, especially at your local elementary or middle school. Help children make deep connections with nature that will last them all their lives.



#### **Become a Citizen Scientist**

No public land management agency has the staff or the budget to carry out all the necessary tasks to conserve and manage monarch butterflies and monarch habitats. Many agencies and organizations provide training enabling people to conduct monarch monitoring, give public programs, and lead public interpretive walks.

#### **Donate**

If you able, donate your time, talents, books, and monarch butterfly photographs to schools, community groups, garden clubs, or conservation groups.

#### **For More Information**

Visit <http://www.fs.fed.us/monarchbutterfly/>

## Eastern North American Population

### *Overwintering in Mexico*

The eastern population of North America's monarchs overwinters in the same 11 to 12 mountain areas in the States of Mexico and Michoacan from October to late March.

Monarchs roost for the winter in oyamel fir forests at an elevation of 2400 to 3600 meters (nearly 2 miles above sea level). The mountain hillsides of oyamel forest provide an ideal microclimate for the butterflies. Here temperatures range from 0 to 15 degrees Celsius. If the temperature is lower, the monarchs will be forced to use their fat reserves. The humidity in the oyamel forest assures the monarchs won't dry out allowing them to conserve their energy.

### *Directional Aids*

Researchers are still investigating what directional aids monarchs use to find their overwintering location. It appears to be a combination of directional aids such as the magnetic pull of the earth and the position of the sun among others, not one in particular.

### *Clustering in Colonies*



Monarchs cluster together to stay warm. Tens of thousands of monarchs can cluster on a single tree. Although monarchs alone weigh less than a gram, tens of thousands of them weigh a lot. Oyamel trees are generally able to support the clustering butterflies, but sometimes branches break.

*Protection of Oyamel Forest*  
Conservation of overwintering habitat is very important to the survival of monarchs. The Mexican Government

recognized the importance of oyamel forests to monarch butterflies and created the Monarch Butterfly Biosphere Reserve in 1986.

## Western North American Population

Monarchs living west of the Rocky Mountain range in North America overwinter in California along the Pacific coast near Santa Cruz and San Diego. Here microclimatic conditions are very similar to that in central Mexico. Monarchs roost in eucalyptus, Monterey pines, and Monterey cypresses in California.

## Flyways

### *Traveling South*

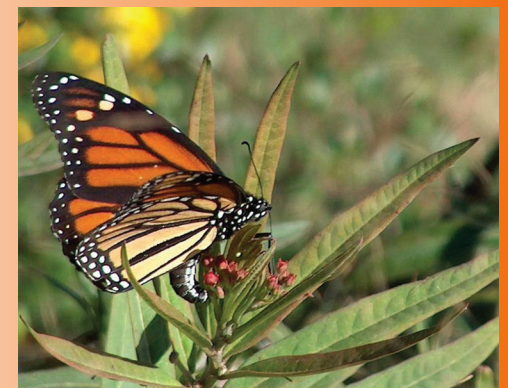
Eastern North American monarchs fly south using several flyways then merge into a single flyway in Central Texas. It is truly amazing that these monarchs know the way to the overwintering sites even though this migrating generation has never before been to Mexico!

### *Congregation Sites*

Monarchs only travel during the day and need to find a roost at night. Monarchs gather close together during the cool autumn evenings. Roost sites are important to the monarch migration. Many of these locations are used year after year. Often pine, fir and cedar trees are chosen for roosting. These trees have thick canopies that moderate the temperature and humidity at the roost site. In the mornings, monarchs bask in the sunlight to warm themselves.

### *Use of Peninsulas*

Monarchs traveling south congregate on peninsulas. The shape of the peninsula funnels the migrating butterflies.



At its tip, the monarchs find the shortest distance across open water. They congregate along the shore to wait for a gentle breeze to help them across.

### *Traveling North*

As warm temperatures and lengthening days arrive, the migratory generation of monarchs finishes the development they halted prior to their migration. They become re-productive, breed and lay the eggs of the new generation. This starts the northern journey back to North America. Unlike the generation before them, who made a one-generation journey south, successive generations make the journey north.



### *Multiple Generations*

Generation 1 monarchs are the offspring of the monarchs who overwintered in Mexico. Each successive generation travels farther north. It will take 3-4 generations to reach the northern United States and Canada.

### **We Are Connected**

Because all the migrating monarchs are concentrated in just a few locations during the winter, they are especially vulnerable to harsh weather and to human activities that disrupt or destroy their habitat. This can reduce the number of monarchs that leave the overwintering sites in the spring. Similarly, migrating and breeding monarch populations are vulnerable to harsh weather and to human activities that reduce milkweed and nectar sources. This can reduce the number of monarchs that reach overwintering sites.

## *Habitat Needs*



### **Milkweeds and Nectar Sources**

Whether it's a field, roadside area, open area, wet area, or urban garden; milkweed and flowering plants are needed for monarch habitat. Adult monarchs feed on the nectar of many flowers, but they breed only where milkweeds are found.

### **Importance of Milkweed**

Many butterflies have a single plant required as a food source for their larval form called a host plant. Milkweed is the host plant for the monarch butterfly.

Without milkweed, the larva would not be able to develop into a butterfly. Monarchs use a variety of milkweeds.

### **Different Types of Milkweed**

Over 100 species of milkweed exist in North America, but only about one fourth of them are known to be important host plants for monarch butterflies.

### **So Why Milkweed?**

#### *Protective Chemistry*

Milkweed contains a variety of chemical compounds that make monarch caterpillars poisonous to potential predators. Milkweeds contain a cardiac (heart) poison that is poisonous to most vertebrates (animals with backbones) but does not hurt the monarch caterpillar. Some milkweed species have

their journey. Having these islands of nectar sources is particularly important within large areas of urban and agricultural development. The discontinuous patches of nectar sources are “corridors” that monarchs will follow, like stepping-stones across a stream to complete their migration.

### *Conservation in North America*

The persistence of the monarch butterfly’s spectacular and unique migratory phenomenon is dependent on the conservation of habitats in Canada, the United States, and Mexico. No species better symbolizes the ecological links among the three countries.

Many government agencies, organizations, and individuals across North America are working on projects to conserve monarch habitats and the migration phenomenon.

- Since 1993, the U.S. **Forest Service International Programs** has been working with Monarch Butterfly Biosphere Reserve managers and partners in the region to build management capacity, to provide guidance to communities for resource management, and to conserve natural resources in the core zone of the Reserve. Staff from the Willamette National Forest and other units has provided training and consultations to the Reserve on forest inventory, GPS/GIS utilization, and design and maintenance of trails. Through a partnership with the Monarch Model Forest, partners developed proposals to help the Model Forest with recreation management,



Photo by Charles Peirce

landscape ecology, small-scale wood product development and marketing, and community incentive programs. Working with local communities adjacent to the Monarch Butterfly sanctuaries, project participants worked to reforest lands using native tree species—with the long-term goal of establishing alternative sites for extracting wood. Apart from reforestation, the Model Forest and its partners have worked on recreation and eco-tourism.

- **North American Monarch Conservation Plan.** Representatives of agencies, academia, and nongovernmental organizations from Canada, the United States, and Mexico are working together to develop a North American Monarch Conservation Plan to address monarch conservation utilizing a habitat-based flyway approach. A nine-member planning committee has been formed to develop a plan that addresses monitoring, habitat conservation, and public outreach and education.



- **The Trilateral Monarch Butterfly Sister Protected Area (SPA) Network** is a partnership of wildlife refuges and national parks in the United States and Canada, and natural protected areas in Mexico working together on monarch conservation projects. The SPA network, a project of the Trilateral Committee for Wildlife and Ecosystem Conservation and Management, collaborates on monarch habitat preservation and restoration; research

Photo by Bob Nichols

and monitoring; and environmental education and public outreach.

## *Things You Can Do*

### **Learn for a Lifetime**

Take some time to learn about monarch butterflies as well as other pollinators and their habitats. Where do you start?

- Print and electronic media offer a staggering amount of information on every aspect of monarch butterfly biology, distribution, and conservation.
- Search the Internet for information about the monarch butterfly.
- Contact your local public or university library. Library staff can direct you to reference materials useful to the beginner as well as those already knowledgeable about monarch butterflies.
- Local organizations such as garden clubs, your state's native plant society, Master Gardener's Program, Master Naturalist's Program, and other nature-oriented groups may be great monarch butterfly resources. These organizations and groups often offer public programs about wildflowers, pollinators, butterflies, and monarch butterfly conservation.
- Visit a nearby botanic garden or arboretum. They are vast resources of information and offer many workshops, field tours, and lectures open to the public.
- The Monarch Watch Reading Room has some great information about monarch butterfly resources.
- Take a class about your local butterflies and wildflowers at a nearby community college.



- Attend local Earth Day activities in your town or participate in National Pollinator Week activities.

### **Practice Good Stewardship**

Be a thoughtful consumer and a good citizen of planet earth. Garden responsibly, avoiding species that are invasive and may escape into the local environment. Many native plants and natural areas are threatened by competition from invasive species.



### **Butterfly Gardening**

Use native plants in your butterfly gardens, as they are the species that monarch butterflies have always depended upon. Native plants are adapted to your local environment and do not require the extra care that plants from far away

places require. When incorporating native plants into your landscape, make sure they are not wild-collected. When hiking through your favorite natural areas, enjoy the monarchs and native wildflowers and make note of their preferred nectar plants, but do not collect them from the wild.

Garden-worthy butterfly plants are often available from seed exchanges and native plant nurseries. Your local native plant society can provide you with a list of reputable local nurseries and garden centers that sell native plants beneficial to monarchs and other pollinators.

Use care when using herbicides and pesticides. These chemicals can negatively affect non-target species. Rather than broadcasting herbicides or pesticides, spot treat. Overall, limit your use of herbicides and pesticides. Look for natural ways to reduce weeds or pests (flytraps, pheromone traps, or hand pulling weeds). Hire professionally trained Integrated Pest Management personnel who use physical controls and low toxicity products to manage pests.

## Become a Certified Monarch Waystation

Register your butterfly garden as a Monarch Waystation and assist in the conservation of the monarch butterfly in North America.



### Be an Advocate

Find out what is planned for your neighborhood, your city, your state, and your national wildlife refuges, national forests and grasslands, and other federal public lands. These are public lands, your lands. Speak up for conservation of

butterflies, especially

monarchs, native plants and their habitats. The agencies responsible for the management of our public lands invite public comment about their plans for managing, developing, and regulating public lands. Embrace your civic privilege and make your voice heard.

### Join

Join a group that supports butterfly and plant conservation. At local, state, national, and international levels there are many organizations that need your support, and will welcome you as a member. Attending meetings of these organizations will be an enjoyable and enlightening opportunity. You will meet other folks who are concerned about monarchs and other butterflies and their habitats. The fellowship you will experience will inspire you, and your enthusiasm will inspire others, to care for delicate yet amazing insects.

### Share Your Knowledge and Passion

Others that came before you led butterfly walks, taught local butterfly wildflower classes, and in so many ways shared their knowledge and passion about monarchs and

from 2–5 weeks during which they mate and lay the eggs that become the next generation. The last generation of the year does not become reproductive and is said to be in “reproductive diapause.” These butterflies are the ones that migrate to Mexico where they overwinter. These butterflies become reproductive in February and March as they move north, laying eggs on milkweeds as they progress northward into the United States. Some of these butterflies can live as long as 9 months!



The migratory generation has an enormous task ahead of them. Weighing less than a gram, these unique butterflies will fly between 2,000 to 3,000 miles to an overwintering location in Mexico.

### *Migration and Overwintering*

The annual migration of North America’s monarch butterfly is a unique and amazing phenomenon. The monarch is the only butterfly known to make a two-way migration as birds do. Unlike other butterflies that can overwinter as larvae, pupae, or even as adults in some species, monarchs cannot survive the cold winters of northern climates. Using environmental cues, the monarchs know when it is time to travel south for the winter. Monarchs use a combination of air currents and thermals to travel long distances.

### Where Do Monarchs Go?

Monarchs in Eastern North America have a second home in the Sierra Madre Mountains of Mexico. Monarchs in Western North America overwinter in California.



higher levels of these toxins than others. Monarchs show preference to some milkweed species.

#### *Protective Coloration*

The adult monarch and monarch larvae are both brightly colored serving as a warning to potential predators that they are poisonous. Unsuspecting predators only need to taste a monarch butterfly or larva once to learn not to eat them again. Most animals quickly spit them out.

### **In Some Areas, Milkweeds are Considered to be Weeds**

Milkweeds are listed in some states and provinces as noxious weeds. Certain milkweed species are considered noxious because they can be poisonous to cattle and other livestock. In some locations it is difficult to improve habitat for monarch butterflies because of the status of milkweed. Eradication of milkweed is a threat to the monarch butterfly.

There are additional threats to monarch butterflies, such as the use of herbicides and pesticides.

#### *A Few Bad Milkweeds*

There are several native and introduced milkweed plants in the genus *Cynanchum* (swallow-worts) that are also eaten by monarchs. Swallow-worts have similar chemical properties to milkweeds in the genus *Asclepias*, that fool monarchs into laying eggs on them. *Cynanchum* species are not suitable food for monarch larvae. Caterpillars fail to develop into pupae when feeding on them. Please do not plant these milkweeds in your garden.

### **Nectar and Nectar Corridors**

Adult monarchs feed on the nectar from flowers, which contain sugars and other nutrients. Unlike the larvae that only eat milkweeds, adult monarchs feed on a wide variety of nectar bearing flowers. They will visit many different kinds of flowers in their search for food.

An abundance of nectar sources is especially important for migrating monarchs. Monarchs that are preparing to migrate south to Mexico need to consume enough nectar to build up fat reserves. The food they eat before and during their migration south must not only power them through the long journey, but also must sustain them throughout the winter. Over-wintering monarchs feed very little or not at all. As monarchs migrate south, they will actually gain weight as they continue to feed on nectar bearing flowers.



In eastern North America, the monarchs leave the overwintering sites in the spring.

Nectar is essential to making the journey to Texas. Nutrition from early spring nectar bearing wildflowers provides the energy and nutrients for these monarchs to develop their reproductive organs. When they arrive in Texas, they will breed and then die. As the new monarchs emerge they will make their way north. It will take three more generations of monarchs to complete their journey northward and then start the migratory cycle once again.

Nectar corridors are a series of habitat patches containing plants that flower at the appropriate times during the spring and fall migrations. These patches provide stopping-off points for the migrating butterflies to refuel and continue