

Project Name: Living Roadway Trust Fund – Pollinator Poster Series

Project Location: State of Iowa

Project Purpose:

The Living Roadway Trust Fund (LRTF) was established by the Iowa Legislature in 1989. The LRTF works with partners to promote and educate the public about the need for integrated roadside vegetation management (IRVM), and the use of native plants along Iowa's roadsides. Their goals are supported through grants, publications, research, and education programs. As part of their goal to produce educational publications, the LRTF, partnering with Trees Forever and the Xerces Society, conceived a set of 4 posters that would focus on the types and variety of pollinators and their significance to the environment. The posters intend to communicate the beauty, complexity, and interconnectedness of the natural world; our place in it; and our power to affect positive change.

Role of the Landscape Architect or Relevant Party

- Engagement and coordination with partners
- Concept development
- Design development, graphic design and layout
- Reviews, proofs, and revisions
- Coordination with printer

Special Factors and Project Significance

- The significance of the project is the education of the public on our dependence on pollinators and the current risk to their health and habitat.
- The posters explain in four installments the importance of
 - Monarch butterflies
 - Bees
 - Butterflies and Moths
 - Beneficial insects
- They aim to create awareness of our impact on pollinators in our daily activities and in the normal course of economic development and growth.
- Most importantly, the posters offer suggestions for changing behaviors that have been and continue to be detrimental to pollinators and their habitat, as well as new ways to engage and participate in further understanding and appreciating pollinators.



Collaboration between the designer and the client partners was the prime contributor to the success of the project.

Iowa Living Roadway Trust Fund

Trees Forever

The Xerces Society

engagement and collaboration



The focus of the Pollinator Poster Series is educating the public on:

- 1 The role of pollinators**
- 2 The risks to pollinator health and habitat**
- 3 How we can help**
- 4 The value of roadsides and the work of LRTF and its partners**

concept development



1

The Role of Pollinators

One third of all the food we eat depends on pollinators. 85% of plants exist because of bees. Pollinators play a critical role in maintaining our ecosystems. Other wild animals rely on pollinators for the production of food sources such as wild fruits.

concept development



2

Risks to Habitat

Common to all pollinators has been a steady loss of habitat including losses to agriculture and development; the degradation of habitat; and the fragmentation of habitat. Chemicals, pathogens, and invasive species are also serious threats.

concept development



3

How we can help

Each poster describes ways we can improve the environment for pollinators including; creating patches of monarch habitat in a pot on your balcony, in your yard, parks, or schools. Planting native flowers provides habitat for nest sites. Reducing the use of insecticides, and herbicides also helps.

concept development



4

The Value of Roadsides

Roadsides offer valuable wildlife habitat, often connecting remnant patches and creating linear areas of refuge. With more than 75% of Iowa's land allocated to agriculture, roadsides are especially important to wildlife.

Flowering plants along roadsides are important sources of nectar and pollen for pollinators.

concept development



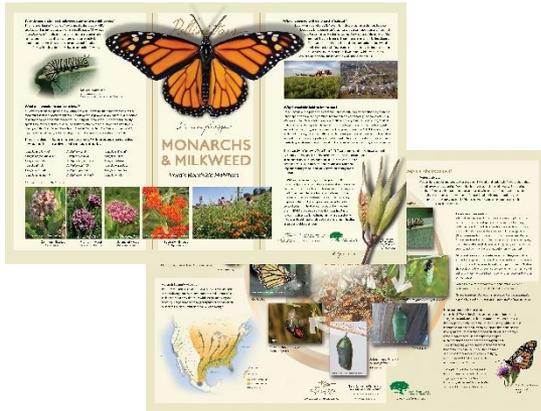
Photography from a multiple collections and several contributors enhanced the overall message of the posters and beautifully communicated the topics and themes.

Narrative was developed from partner resources and vetted between them.

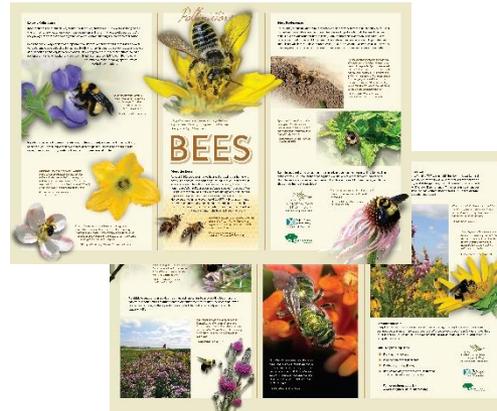
Many topics were best described with illustrations and diagrams designed specifically for the topic.

design development

Poster 1 Monarchs and Milkweed



Poster 2 Bees



Poster 3 Butterflies and Moths



Poster 4 Beneficial Insects



In all, there are 4 posters in the series, developed over the course of approximately 1 year.

The posters are full-color offset print on heavy satin finish paper. Printed front and back, they each measure 23 1/4" x 35 1/4".

design development

Why do monarchs need milkweeds and native wildflowers?

The monarch butterfly is one of Iowa's most celebrated wildlife species, admired for its beauty and inspiring life cycle. Milkweeds (*Asclepias* species) are the only plants that monarch caterpillars can eat, and the butterfly's health and survival is entirely dependent on them. Nectar is the primary food for adult butterflies, which they sip from milkweed and other flowers.



Monarch caterpillar
Photo: William M. Costa, Forest Health Management International, Ripon, WI

What milkweeds are native to Iowa?

Milkweeds are native perennial wildflowers well-known for their important role as the monarch butterfly's larval host plants. Their flowers also provide an abundant, quality source of nectar for a wide diversity of insects, including adult monarchs, many other butterfly species, honey bees, and wild native bees such as bumble bees. Milkweeds have a unique beauty and their distinctive characteristics include intricate flower structure, milky sap, large pod-shaped fruits, and seeds dispersed on the wind by silky white "floss" fibers.

There are eighteen milkweed species native to Iowa. Five have become so rare that they now have special status as threatened or endangered species.

- | | | |
|----------------------------------|--------------------------------|-------------------------------|
| <i>Asclepias amplexicaulis</i> | <i>Asclepias meadii</i> * | <i>Asclepias sullivantii</i> |
| <i>Asclepias engelmanniana</i> † | <i>Asclepias ovalifolia</i> | <i>Asclepias syriaca</i> |
| <i>Asclepias exaltata</i> | <i>Asclepias purpurascens</i> | <i>Asclepias tuberosa</i> |
| <i>Asclepias hirtella</i> | <i>Asclepias quadrifolia</i> | <i>Asclepias verticillata</i> |
| <i>Asclepias incarnata</i> | <i>Asclepias speciosa</i> † | <i>Asclepias viridiflora</i> |
| <i>Asclepias farnesiflora</i> † | <i>Asclepias stenophylla</i> * | <i>Asclepias viridis</i> |

* Endangered in Iowa † Threatened in Iowa



Common milkweed
Asclepias syriaca



Prairie milkweed
Asclepias sullivantii



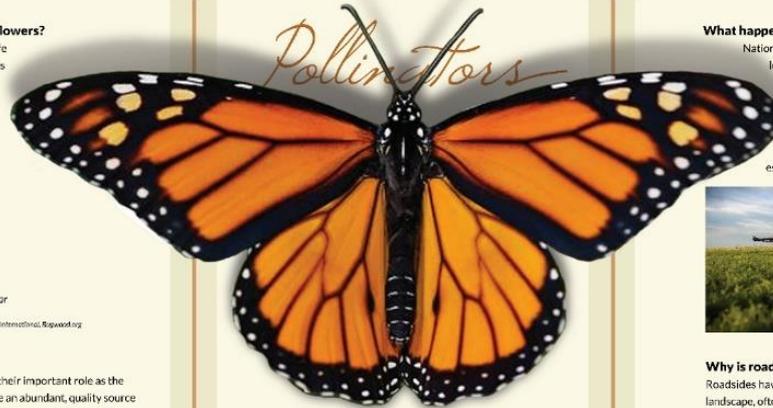
Swamp milkweed
Asclepias incarnata



Butterfly milkweed
Asclepias tuberosa



Photo: David G. Reardon, Iowa Department of Transportation



Danaus plexippus
MONARCHS & MILKWEED
Iowa's Roadside Habitats

What happened to the monarchs' habitat?

Nationwide, much of the wildflower-rich habitat that monarchs need has been lost due to land conversion for agricultural, urban, suburban, and industrial use. For example, several milkweed species were part of the native prairie communities that historically dominated the central United States. To prevent further habitat loss, existing populations of milkweeds and other native wildflowers must be protected. Habitat restoration projects that involve planting milkweeds and wildflowers are also essential to overcome the impacts of widespread habitat loss.



Why is roadside habitat important?

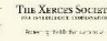
Roadsides have the potential to offer valuable wildlife habitat because they span the landscape, often connecting remnant habitat patches and creating linear areas of refuge. With more than 75 percent of Iowa's land allocated to agricultural production, roadside habitat is especially important to wildlife. The Iowa Department of Transportation, with support from the Living Roadway Trust Fund, has planted more than 100,000 acres of state and county road rights-of-way with native plants; many of these acres include milkweed and several of the monarch's preferred nectar plants. As a result, vast stretches of Iowa's roadsides provide resource-rich habitat for both summer resident and migratory monarchs.

The Iowa Living Roadway Trust Fund (LRTF) was established by the Iowa General Assembly in 1989 and is administered by the Iowa Department of Transportation. Through grants to counties, cities and state agencies, the LRTF's mission is to provide assistance to implement Integrated Roadside Vegetation Management (IRVM).

IRVM is a management system that promotes the use of hardy and adapted native grasses and wildflowers in combination with practices such as mowing, burning, and the limited use of herbicides to control weeds. Due to their extensive root systems, these native plants help improve water quality and provide excellent erosion control benefits. The diverse grasses and wildflowers used in IRVM practices also provide critical habitat for Iowa's insects and wildlife, including monarchs and other invertebrate pollinators, while connecting remnant habitat areas via roadside corridors.



Photo: Milkweed seed pod, Doug Collins, USDA-NRCS PL-19475, University of Wisconsin-Madison



Asclepias incarnata

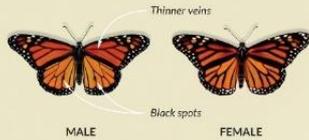
**Poster 1:
Monarchs and
Milkweed**

Female monarchs search for milkweeds on which they lay eggs. Once the eggs hatch, the caterpillars feed voraciously on their host plants for up to two weeks before forming chrysalises. Up to three generations of butterflies are born during the summer.

Pollinators

Life Cycle of a Monarch Butterfly

After mating, female monarchs search for milkweeds on which they lay eggs. Once the eggs hatch, the caterpillars feed voraciously on their host plants for up to two weeks before forming chrysalises. Up to three generations of butterflies are born during the summer. By September, monarchs begin migrating southward and it is possible to see hundreds of butterflies per hour, in flight or nectaring on late-blooming flowers.

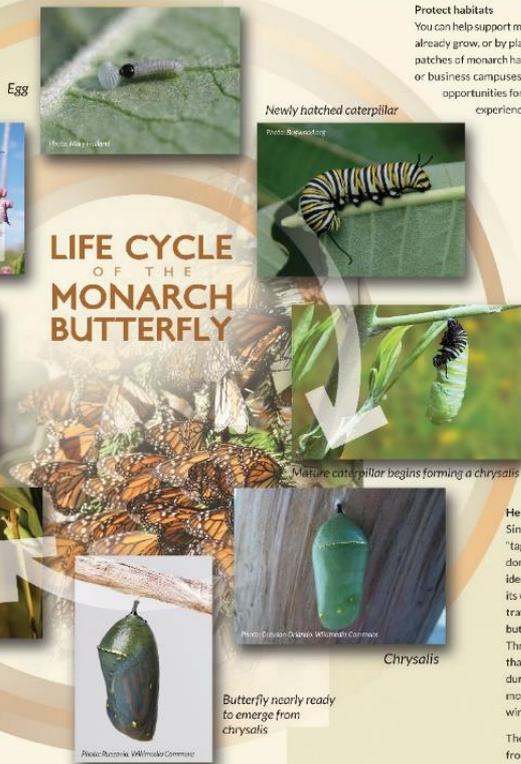


The Viceroy (*Limenitis archippus*) is a North American butterfly that ranges through most of the lower 48 States as well as parts of Canada and Mexico. It is often mistaken for the monarch.



Monarch Butterfly Migration

Typically, monarchs arrive in Iowa as early as May and are present throughout the summer months. Adult butterflies seek nectar that provides them with energy for flying and breeding. Large numbers of migrating monarchs can often be seen at the Neal Smith National Wildlife Refuge.



WHAT CAN YOU DO?

Protect habitats

You can help support monarchs by protecting milkweeds and native wildflowers where they already grow, or by planting flower-rich habitat that includes milkweed. By creating patches of monarch habitat in a pot on your balcony, in your yard, in parks, or on school or business campuses. You will beautify your local environment and provide opportunities for your family, friends, neighbors, and colleagues to share the experience with you.

Create your own garden

When designing a garden or planting plan, complementing one or more milkweed species with summer blooming wildflowers will provide food for both monarch caterpillars and adults. Valuable nectar sources include beggarticks (*Bidens aristata*), blazing stars (*Liatris* spp.), ironweed (*Veronica fasciculata*), New England aster (*Symphytrichum novae-angliae*), and pale coneflower (*Echinacea pallida*), hoary vervain (*Verbena stricta*), and common boneset (*Eupatorium perfoliatum*).

Milkweed seeds can be planted directly in the ground during either fall or spring, in an area that receives full sun for several hours a day and has been cleared of competing weeds. Scatter the seeds onto the soil surface, cover them with a thin layer of soil, and press the seeds into the soil with a trowel or the soles of your shoes.

Note: The plants may not flower in their first year, and watering will likely be needed to aid establishment.

To help keep monarchs and other pollinators healthy, please avoid applying insecticides to or near milkweeds and other flowering plants.

Help track monarch migration

Since the 1970s, scientists have used a technique called "tagging" to study monarchs' migratory movements. This is done by gently applying a small, sticker-like tag with a unique identifying number to a butterfly's wing and then sending it on its way. To capture information about an individual butterfly's travels, someone must later sight the tagged butterfly and report its location and tag number. Through tagging, pioneering researchers learned that monarchs hatched in the United States during the late summer are capable of flying more than 2,000 miles to spend the winter in central Mexico.

The optimal window for tagging is from late August to early October. Tagging kits can be purchased from University of Kansas' Monarch Watch online at <http://monarchwatch.org>



Poster 1: Monarchs and Milkweed

By September, monarchs begin migrating southward and it is possible to see hundreds of butterflies per hour, in flight or gathering nectar on late-blooming flowers.

Expert Pollinators

Insects such as bees, butterflies, moths, beetles, flies, and wasps visit flowers seeking food in the form of sugary nectar or protein-packed pollen grains—or, in the case of bees, both. As they forage, they transfer pollen grains between blooms, enabling the plants to reproduce.

Bees are particularly efficient and important pollinators. Whereas other insects visit a flower to feed, female bees collect pollen as food for their offspring and, consequently, carry a great deal of pollen as they fly between blooms. They carry pollen in special structures, called a pollen brush or pollen basket, and some of it brushes off as they visit flower after flower—a hundred or more in a foraging trip—which results in pollination.

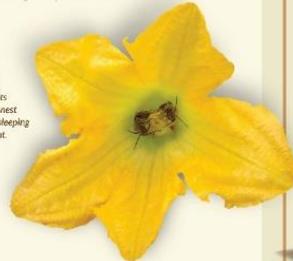


Bumble bees (Genus *Bombus*) visit a wide variety of flowers, and are a familiar sight in roadsides, farms, gardens, and prairie. (Photograph © Betsy Betros)

Nearly 85 percent of flowering plants around the world rely on bees and other pollinators to reproduce. In fact, more than two-thirds of crop species—crops that produce fruits, vegetables, spices, nuts, seeds, and livestock forage—depend on them.

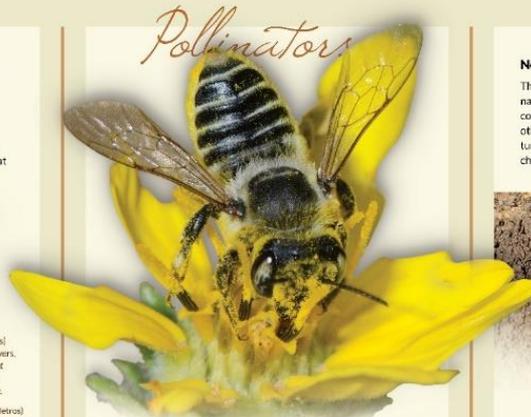
Squash bees (genus *Pepo*) live their entire lives around squash plants. Females will nest in the ground below squash plants and the males, because they do not have a nest to return to at night, will often be found sleeping inside the flowers, like those to the right.

(Photograph by Nancy Adamson, The Xerces Society)



To reach the nectar in apple blossoms, mining bees (genus *Andrena*) clamber over the pollen-producing stamens, making them highly effective pollinators. Other species of bees will walk on the petals to reach the nectar, making limited contact with pollen.

(Photograph by Nancy Adamson, The Xerces Society)



A leafcutter bee carries dry pollen grains trapped between stiff hairs on her abdomen, showing here on a yellow fringe. (Photograph © Bryan E. Reynolds)

BEEES

Meet the Bees

At least 3,600 species of native bees call the U.S. their home, with nearly 300 species—and counting!—found in Iowa. There are also several species of bees that have been introduced, of which the honey bee (*Apis mellifera*), a domesticated species introduced from Europe, is most familiar. Honey bees are managed by beekeepers to provide crop pollination services as well as honey production. Honey bees live in large colonies of 20,000 individuals or more that work cooperatively. For example, the role of the queen bee within each hive is to reproduce, while her worker bees divide up duties to maintain the hive and feed the colony.



Honey bees are very unusual bees. Few other species live in such huge colonies with organized workers performing separate jobs on agriculture and store honey.

(Photograph by Waupesa, Wikimedia Commons/CC0.0 BY-SA)

Nest Preferences

The nesting habits of North America's native bees are very different from honey bees. Most native bees live solitary lives, with each female working alone to build her small nest and collect and provide food for her offspring. Some solitary bees visit a diversity of flowers, others a particular species. Many bees in the Midwest nest underground, digging slender tunnels off which they build cells for each egg and its provisions. Other bees nest in cavities, chewing into the pithy center of stems, or nest in existing holes, sometimes man-made.



Mining bees (Genus *Andrena*) are among the thousands of species that nest at the ground. Each female digs a narrow tunnel, off which she creates a series of brood cells. She provisions each cell with nectar and pollen and lays an egg. Their nests appear in spring, frequently with a mound of excavated soil around the entrance. If you watch carefully, you will be rewarded by a glimpse of the bee leaving her nest. (Photograph by Whitney Cranshaw, Colorado State University Bugwood.org)



Species such as small carpenter bees (Genus *Ceratina*) chew a nest tunnel into roseberry canes and other plants with twigs that have soft, pithy centers. (Photograph by Jennifer Hopwood, The Xerces Society)

Bumble bees and some sweat bees are the only native bees that form social colonies. Their colonies are much smaller than a honey bee hive, usually fewer than two hundred bees. Bumble bees tend to nest under clumps of grass or in old rodent nests (two things that can be found on roadsides).



Bumble bees (Genus *Bombus*) live in small colonies of dozens to a couple hundred individuals. (Photograph by Jennifer Hopwood, The Xerces Society)



Poster 2: Bees

At least 3,600 species of native bees call the U.S. their home with nearly 300 species found in Iowa. Honey bees live in large colonies of 20,000 individuals or more that work cooperatively.

What's the Buzz?

Native bees have a skill honey bees lack: they can vibrate the pollen out of the blossoms, a technique called buzz pollination. Bumble bees are particularly adept at this. As a result they are key pollinators of crops like blueberries and tomatoes and wildflowers such as shooting stars (Dodecatheon).

Several species of native bees, like this solitary mining bee (genus *Andrena*), shake pollen from blueberry flowers by wrapping themselves around the blossoms and vibrating their flight muscles.

(Photograph by Nancy Adamsen, The Xerxes Society)

The rusty patched bumble bee (*Bombus affinis*) is one of America's most endangered bumble bees. Once common from North Dakota to the Atlantic, it is now found at only a few scattered sites.

(Photograph by Rich Hatfield, The Xerxes Society)

Roadside vegetation can provide much needed habitat for bees, providing food, nesting habitat, and connections to other patches of habitat. With more than 75 percent of Iowa's land allocated to agricultural production, roadside habitat is especially important to the state's wildlife.

It might seem strange, but fewer bees or butterflies are killed on roads that have flowers growing beside them. Because there is less to eat on the roadside, pollinators stay there rather than going in search of food elsewhere.

(Photograph by Iowa LRTF)

THE VALUE OF ROADSIDES

Flowering plants along roadsides are important sources of nectar and pollen for bees, both those that spend their entire life within the roadside and those that reproduce or overwinter elsewhere. The best roadsides for bees include a diversity of native flowers with a succession of bloom throughout the growing season.

Practices such as Integrated Roadside Vegetation Management (IRVM) can benefit pollinators and their habitat while meeting the functional requirements of roadside vegetation. IRVM is a management system that promotes the use of hardy and adapted native grasses and wildflowers in combination with practices such as mowing, burning, and the targeted use of herbicides to control weeds. Due to their extensive root systems, native plants help improve water quality and provide excellent erosion control benefits.



Not all bees have yellow stripes. Bees are a highly diverse group of insects and may be black or brown with stripes of yellow, white, or orange, or have bodies that are metallic glaucous blue or, in the case of this green sweat bee (genus *Augochloropis*), metallic green flecked with gold.

(Photograph © Bryan Reynolds)

The Iowa Living Roadway Trust Fund

The Iowa Living Roadway Trust Fund (LRTF) was established by the Iowa General Assembly in 1989 and is administered by the Iowa Department of Transportation. Through grants to county, city, and state agencies, the LRTF's mission is to provide assistance to implement IRVM. The Iowa Department of Transportation, with support from the Living Roadway Trust Fund, has planted more than 200,000 acres of state and county road rights-of-way with native plants.

When thoughtfully planned and carefully maintained, Iowa's roadsides can be alive with wildflowers, giving important food and shelter to the state's bees.

(Photograph by Iowa LRTF)

Several species of bumble bees are becoming increasingly rare, including the American bumble bee (*Bombus pennsylvanicus*), shown here. Roadside flowers provide them with nectar and pollen.

(Photograph © Bryan Reynolds)



Bees need our help

Many bumble bee species, as well as colonies of managed honey bees, are experiencing declines due to a loss of habitat, the spread of disease, overuse of pesticides, and various other factors. Declines of bees may impact agricultural yields and put the health of natural ecosystems at risk.

Four Things to Help Bees

- Plant native flowers
- Provide habitat for nest sites
- Protect from insecticides
- Reduce mowing and herbicide use in road ditches in front of your property

For more information, visit www.BringBackThePollinators.org.



Poster 2: Bees

Bees are not only at risk from habitat loss but also the use of pesticides, herbicides, and exposure to pathogens. Competition from non-native species is also a risk factor.

Butterflies may well be the best loved of all insects. For millennia, these large and showy insects have attracted the attention and admiration of people around the world. In addition to their beauty and grace, butterflies and their close relatives, moths, play important ecological roles. For example, many birds are reliant on butterfly and moth caterpillars as a food source for their young, and as fuel to maintain the high energy levels required for migration. Small mammals, reptiles, and a number of invertebrates also dine on caterpillars. Butterflies and moths are also pollinators of a number of plants, including prairie phlox (*Phlox pilosa*), a plant that relies on butterflies for pollination, and the western prairie fringed orchid (*Platanthera praecox*), which is pollinated by hawk moths.



Several species of blues and hairstreaks have evolved a relationship with ants: the caterpillars exude honeydew that the ants consume and in exchange protect the ants from other predators.



Butterfly-pollinated plants often bloom during the day and provide nectar at the bottom of a long narrow tube or spur. The flowers butterflies prefer often have a sweet odor, typically provide a large enough surface for a butterfly to land on, and have blooms in colors that butterflies can see, usually red through violet on the color spectrum and often in ultraviolet.

(Photo by Joshua Mayer, Flickr/CC BY-SA 2.0)

Butterfly or moth?

Butterflies and moths can be difficult to tell apart. It is easiest to distinguish between them when they are at rest, as illustrated by these photos.



Butterflies tend to hold their wings either partially open in a V-shape or pressed together.



Most moths hold their wings flat, like paper airplanes, or slightly pitched, with the forewings over the hindwings, covering their body like a tent.

(Photograph by Xerces Society/Mattew Shepherd)



Butterfly antennae have a clubbed bulb-like tip.

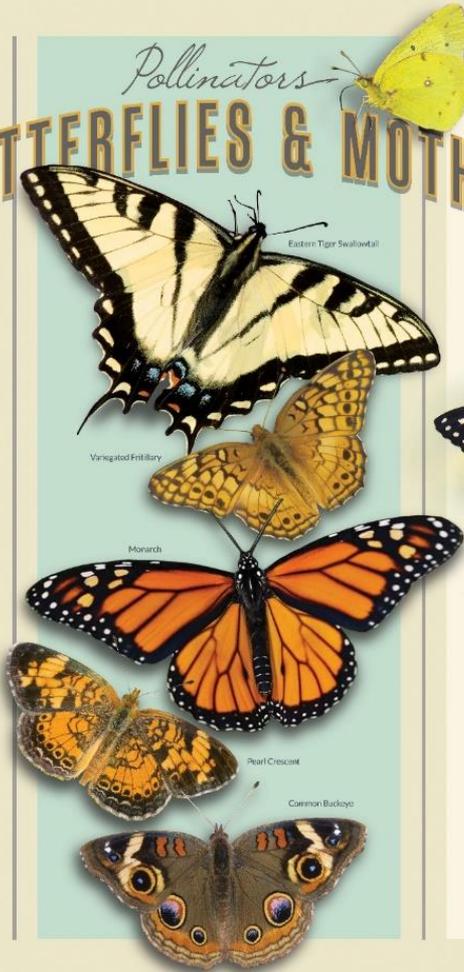


Male moths have feathery antennae which help them detect female sex pheromones.



Female moths have antennae that are a single filament that tapers to a point.

Pollinators BUTTERFLIES & MOTHS



Growing up in four stages

Over the course of their life cycles, butterflies and moths go through a remarkable transformation: grub-like, leaf-chewing caterpillars become winged, nectar-drinking adults. There are four distinct stages to this transformation: egg, caterpillar, chrysalis (or cocoon for moths), and adult. Butterfly or moth eggs are laid on particular plants, called host plants, which are carefully selected by the female. Caterpillars eat and eat and eat, consuming a tremendous amount of plant mass and ultimately growing to hundreds of times their original size. Along the way they shed and regrow their exoskeleton, the hard outer shell that provides body structure. The fully grown caterpillar becomes a chrysalis, a period during which it undergoes drastic changes as its body restructures itself to eventually emerge as a winged adult. Once free of the chrysalis, freshly emerged butterflies take flight in search of food and a mate.



**Poster 3:
Butterflies
And Moths**

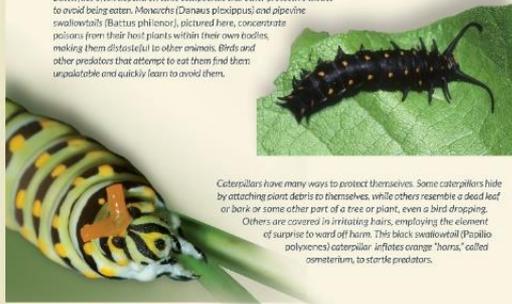
For millennia, these large and showy insects have attracted the attention and admiration of people around the world. In addition to their beauty and grace, butterflies and their close relatives, moths, play important ecological roles.



Importance of a good diet

Many species of grasses, wildflowers, shrubs, and trees are host plants critical for a butterfly (or moth) to complete its life cycle. Caterpillars of some species will eat only a single species of plant or several very closely related plants, while other species will eat a wide range of plants from multiple families. For example, caterpillars of the regal fritillary (*Speyeria idalia*) feed exclusively on violets, particularly prairie violets (*Viola pedatifida*), and will not survive without their host plant. At the opposite end of the spectrum is the gray hairstreak (*Strymon melinus*), a butterfly whose caterpillars will munch on over 80 different plant species.

Butterflies often depend on toxic compounds and other protective tactics to avoid being eaten. Monarchs (*Danaus plexippus*) and pipevine swallowtails (*Battus philenor*), pictured here, concentrate poisons from their host plants within their own bodies, making them distasteful to other animals. Birds and other predators that attempt to eat them find them unpalatable and quickly learn to avoid them.



Caterpillars have many ways to protect themselves. Some caterpillars hide by attaching plant debris to themselves, while others resemble a dead leaf or bark or some other part of a tree or plant, even a bird dropping. Others are covered in irritating hairs, employing the element of surprise to ward off harm. This black swallowtail (*Papilio polyxenes*) caterpillar inflicts orange "horns" called cornicles, to sterile predators.

Energy-rich nectar is the primary food source for most adult butterflies. They have long, tubular mouthparts that they unfurl and insert into flowers to sip nectar. Some butterflies obtain sugar from tree sap, rotting fruit, or aphid honeydew. To acquire additional nutrients, minerals, and salts, butterflies, males in particular, sometimes seek liquid from carcasses, animal waste, puddles, and moist soil. Some adult moths also sip nectar, but there are many moths that do not consume anything as adults, living just long enough to mate and deposit their eggs.



Butterflies and moths have a long tubular mouthpart, called a proboscis, which they unfurl and insert into flowers to sip nectar.

BUTTERFLIES & MOTHS IN PERIL



Dakota Skipper (*Hesperia dacotae*)

to moth (*Utatemaria*)

Disappearing act

A number of butterflies and moths in Iowa are in decline, with some on the verge of extinction. Many of these species are habitat specialists. For example, several butterflies that depend on prairie habitat have disappeared from Iowa in recent years, including the Poweshiek skipperling (*Oarisma poweshiekii*) and the Dakota skipper (*Hesperia dacotae*). But butterflies and moths that were once broadly distributed are also struggling, including giant silkworm moths (family Saturniidae) and the monarch butterfly (*Danaus plexippus*). Butterflies and moths face a wide range of threats, including habitat loss and fragmentation, climate change, pesticides, invasive plants, introduced predators and parasites, and diseases. Loss of both host plants for caterpillars and places with nectar-producing flowers can have a profound impact on butterfly populations and are the leading causes of decline.



While it's unlikely that Iowa's most imperiled butterflies will appear in your garden alongside common buckeyes, it's important to realize how actions at both local and regional levels can contribute to the conservation or decline of these species. Every patch of habitat makes the landscape better for butterflies, reducing the pressure on declining species.

The Value of Roadsides

Flowering plants along roadsides are important sources of nectar and host plants for butterflies, both those that spend their entire lives within the roadside and those that reproduce or overwinter elsewhere. The best roadsides for butterflies include a diversity of native plants with a succession of blooming flowers throughout the growing season.

Practices such as **Integrated Roadside Vegetation Management (IRVM)** can benefit pollinators and their habitat while meeting the functional requirements of roadside vegetation. IRVM is a management system that promotes the use of hardy and adapted native grasses and wildflowers in combination with practices such as mowing, burning, and the targeted use of herbicides to control weeds. Due to their extensive root systems, native plants help improve soil quality and water quality and provide excellent erosion control benefits.

Monarchs gather on Meadow Blazing Star (*Liatris scariosa*) in a roadside planting along Highway 14 north of Marshalltown, Iowa.

(Photograph by Meredith Birchard/Trees Forever)



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There are approximately 118 species of butterflies and over 2,500 species of moths found in Iowa. Regal fritillary butterflies (*Speyeria idalia*) are one of several species of conservation concern. Found only in remnant tallgrass prairie, regal fritillaries have declined as their habitat has disappeared.



A special thank you to Bryan E. Reynolds for his generous contribution of photography. All photos on this poster are attributed to Bryan unless otherwise noted.

**Poster 3:
Butterflies
And Moths**

Loss of habitat includes loss of natural areas to agriculture or development, the degradation of habitat, and the fragmentation of habitat. Many migratory species depend on native vegetation along the route. Fragmentation may cause weaker individuals to fail during the journey.

Good for Flowers and So Much More

While bees are the most efficient pollinators and butterflies the most noticeable, they are not the only pollinators. Beetles, wasps, and flies also help with pollination, but they are possibly more important as pest control. As predators or parasitoids, they eat other insects and help keep pest populations in check. Their work, and that of other beneficial insects, is essential in natural systems, gardens, yards, parks, and farms.



Soldier beetles are pollinators as well as predators. While adults visit flowers to eat nectar and pollen, larvae feed through leaf litter for small insects and worms. Many predators have very different diets from the larval to adult stages, including the goldenrod soldier beetle pictured here.

Predators hunt and consume other insects. Some are predaceous in one life stage, such as flower flies whose larvae eat aphids and adults drink nectar, while others are active predators throughout their life. Many predators are not picky and will feed on a wide range of insects larger or smaller than themselves. Some, like tiger beetles, run fast and chase down their prey. Lady beetles move more slowly but will methodically chew their way through a whole colony of aphids. (A single lady beetle may eat up to 5,000 aphids in its lifetime!) Other predatory insects include soldier beetles, ground beetles, lacewings, big-eyed bugs, assassin bugs, minute pirate bugs, and predatory wasps.



Tiger beetles are fast. Five mph may not seem speedy to us but that is more than 120 body lengths per second for a beetle. Can you do that? In fact, they run too fast for their eyes to see. They repeatedly pause to reorient on the prey before launching into pursuit again.



Lady beetles love aphids. They eagerly feed on soft-bodied insects both as larvae and adults. (Photograph: rackarBIO, Flickr.com.)

Pollinators

BENEFICIAL Insects

Parasitoids are insects that lay their eggs on or inside another insect. The larvae of parasitoid insects (some wasp, fly, and beetle species) feed on—and ultimately kill—the host insect before emerging as adults. Most parasitoids are specialists, meaning they only attack one or a few host species. For example, tephritid wasps are primarily parasitoids of scarab beetle larvae, including Japanese beetles. Because of their lifestyle and often small size, parasitoids can be easily overlooked, but we'd quickly notice if they weren't around.



This tiny scellonid wasp just emerged from an egg but not its own. These parasitoid wasps specifically seek out silk bug eggs in which to lay their own eggs. (Photograph: David Capparet, Bugwood.org.)

The Importance of a Well-Balanced Diet

Flowers are important to these predators and parasitoids because they require other food in addition to prey. Many of them feed on nectar or pollen during one or more of their life stages; nectar fuels the hunt and pollen is a supplemental source of protein for some predatory insects when prey is in short supply or during egg laying. Flowers enable them to complete their life cycle.

The larval or immature stages of these insects are often found in different locations from adults due to differences in diet. For example, flower fly larvae may be found feeding on aphids and other small insects on plant stems, whereas adults will be found primarily on flowers, eating nectar or occasionally pollen.



*Like other syrphids, the traverse flower fly (*Eristalis traversae*) has a very different diet as an adult and larva. Adults visit flowers for nectar and pollen, but as larvae they feed on small insects and insect eggs.*



More than an inch long and with a distinctive cog-like crest, the wheel bug is easily identified. But be careful if you find one. They are just as likely to try to suck juices from you as any insect prey!

Poster 4: Beneficial Insects

Beetles, wasps, and flies also help with pollination, but they are possibly more important as pest control. As predators or parasitoids, they eat other insects and help keep pest populations in check. Their work, and that of other beneficial insects, is essential in natural systems, gardens, yards, and parks.

Put Out the Welcome Mat

In addition to flowering plants, many beneficial insects also require shelter for overwintering or for egg-laying. Predatory wasps (such as potter, thread-waisted, digger, mud dauber, and sand wasps) will dig underground, occupy cavities, or build their nests using pieces of grass, mud, or resin. Some beetles need leaf litter or clumps of bunch grasses in which to reproduce and overwinter.

Land management practices can greatly impact these beneficial insects in both positive and negative ways. Insecticide use has negative effects, but tillage, and mowing of ditches and fence lines also can harm beneficial insect populations by depleting their needed food, shelter, or overwintering habitat. On the other hand, adding native flowering trees, shrubs or wildflowers, or roadsides, creates habitat that supports these insects.



Potter wasps (above) create beautiful earthen cells (right) attached to plant stems.

There are additional benefits to welcoming these insects. The same habitats that support predators and parasitoids also support a diverse array of pollinators, including bees and butterflies. All of these insects in turn provide food for other wildlife such as songbirds and game birds. Native shrubs, grasses, and wildflowers can also reduce soil loss and improve water quality by filtering runoff from cropland or urban landscapes.



Smaller than a grain of rice, pirate bugs prefer to feed on aphids, whiteflies, caterpillars, and other soft bodied insects, but will drink nectar when prey is scarce.

(Photographic: USGA-AHS, Jack Dykinga)



Paper wasps strip wood fibers from fences, decks, and other exposed timbers, which they mix with saliva to make their nests, hence their name. Each cell is supplied with paralyzed prey (like caterpillars) to feed their offspring.

Be a good neighbor to helpful insects

Insects that prey upon or parasitize crop pests tend to be more susceptible to insecticides than pests. Strategies to reduce impacts of insecticides to beneficial insects include:

- Use insecticide only when pressure from pests provides no other option
- Target insecticide use to where a pest problem exists
- Use chemicals with short residual toxicity or specifically targeted for that pest
- Reduce insecticide drift to keep applications on target

This thread-waisted wasp (Phaenocarpa spp.) sips nectar from butterfly milkweed (Asclepias tuberosa). Nectar is high energy, fueling the wasp's hunting activities.



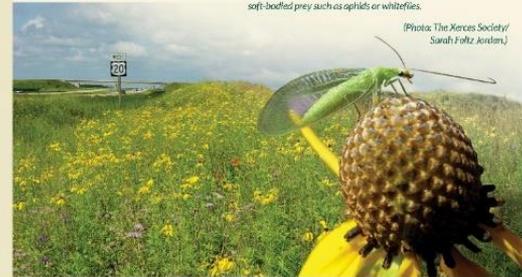
The Value of Roadsides

Flowering plants along roadsides are important sources of food and native grasses and undisturbed soil serve as shelter for beneficial insects. Roadsides that include a diversity of native plants with a succession of blooming flowers throughout the growing season provide the best habitat for the insects that provide natural pest control. Roadside habitat can also support populations of beneficial insects that provide pest control in nearby crop fields.

Practices such as Integrated Roadside Vegetation Management (IRVM) can benefit predators, parasitoids, and pollinators as well as their habitat while meeting the functional requirements of roadside vegetation. IRVM is a management system that promotes the use of hardy and adapted native grasses and wildflowers in combination with practices such as mowing, burning, and the targeted use of herbicides to control weeds. Due to their extensive root systems, native plants help improve soil quality, water quality, and provide excellent erosion control benefits.

The adults of green lacewings fly with glass-like wings from flower to flower to drink nectar and seek places to lay eggs. Their larvae are fierce predators, scurrying across foliage in search of soft-bodied prey such as aphids or whiteflies.

(Photo: The Xerces Society/ Sarah Foltz Jordan)



The Iowa Living Roadway Trust Fund (LRTF) was established by the Iowa General Assembly in 1989 and is administered by the Iowa Department of Transportation. Through grants to county, city, and state agencies, the LRTF's mission is to provide assistance to implement IRVM. The Iowa Department of Transportation, with support from the Living Roadway Trust Fund, has planted more than 100,000 acres of state and county road rights-of-way with native plants.



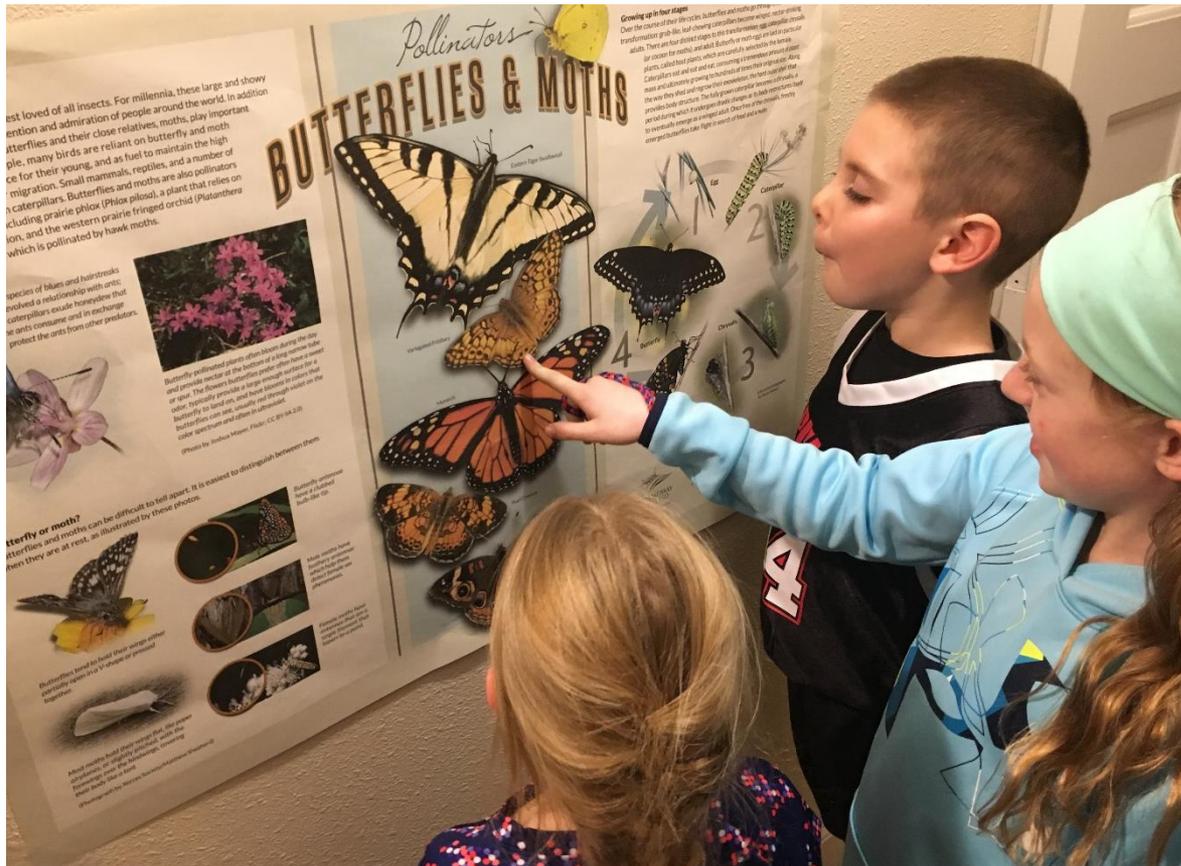
Not all "beneficial insects" are insects! Spiders, mites, and harvestmen —arachnids rather than insects— all have a role to play in controlling pests and maintaining a balanced environment.



A special thank you to Bryan E. Reynolds for his generous contribution of photography. All photos on this poster are copyrighted to Bryan unless otherwise noted.

Poster 4: Beneficial Insects

Many insects feed on nectar or pollen during one or more of their life stages; nectar fuels the hunt and pollen is a supplemental source of protein for some predatory insects. Flowers enable them to complete their life cycle.



The Iowa Living Roadway Trust Fund distributes the posters through the Iowa Department of Transportation. They are commonly used in classrooms but are available free of charge to anyone interested in pollinators.

public education