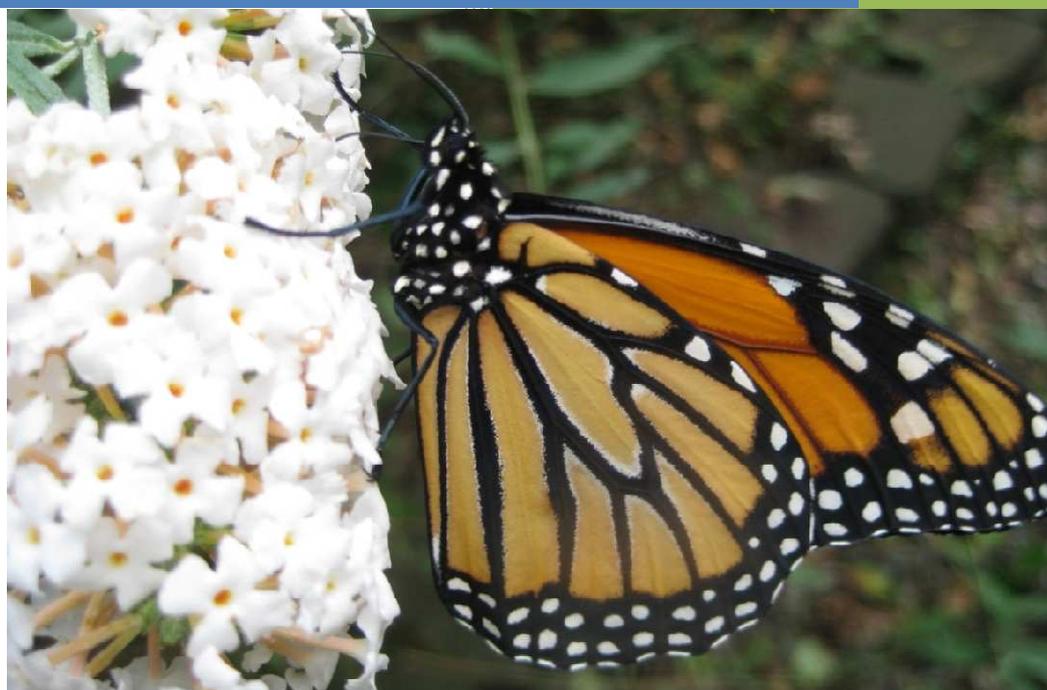


Schoolyard Ecology: *Creating a Butterfly Garden for NJ Schools and Afterschool Programs*



By Willa Schaefer

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Introduction

The garden that you will be establishing should include the suggested plants that are listed in this guide. The diversity in plant species, type, and color will help to bring diversity to your garden. The more diverse the plant life is in your garden, the more pollinators you will attract and the more successful garden it will become. The plants suggested in this guide are all native to New Jersey. Planting native plants attracts native pollinators, reduces maintenance time, and helps your local ecosystem to become richer and more diverse. The pollinators that you will be attracting will not only include butterflies but also bees, beetles, flies, moths, among other pollinators. Establishing a garden in your school yard or afterschool program will help to establish or maintain a healthy ecosystem in your area.

Butterfly gardens are not only important for your local schoolyard habitat but they can increase student engagement and curiosity in the classroom. By planting a butterfly garden you have created an interactive classroom for your children to be engaged in the natural world. This outdoor classroom can be a tool to incorporate hands-on activities for every subject! Many students do not spend their time outdoors; providing them a garden that can be used by your school or program can give them an opportunity to be outside and interact with nature. By planting a garden in your school or afterschool program your children will develop a connection with the outdoors from an early age. This enriching experience for children will be something that they will keep with them for the rest of their lives.

It is important to educate your students, school, and community about the importance of planting native gardens so that you can help create more gardens around your community. The more gardens there are that are free of pesticides, herbicides, and full of native plants the healthier your area's ecosystem will be!

This guide is a suggestion for educators and afterschool providers to help build, plant, and maintain a butterfly garden in their school or afterschool program. I highly recommend some of the suggested resources at the end of this guide to further your knowledge on butterfly gardens, pollinators, and butterflies.



Why Build a Butterfly Garden?

How a Butterfly Garden Can Increase Student Learning

Implementing inquiry based activities that focus on the nature of science can enhance your students understanding of science. Creating a butterfly garden can engage students in the natural world and enrich their learning experience.

Students learn best when they are allowed to develop their understanding of concepts over time (Bybee 8). This is a learning theory that reduces the focus on memorizing facts, vocabulary, and theories and emphasizes the importance of teaching for meaning and understanding. Identifying students pre-existing knowledge is important to recognize and know when creating and teaching lessons. Students come to learning situations with knowledge and explanations from their world. As students develop their understanding they link new information with the knowledge they bring to the learning experience (Bybee 8). Inquiry uses students' pre-existing knowledge to build upon it and allowing students to become actively involved in the learning process by questioning, analyzing, and becoming engaged in the material.

A model for inquiry includes five stages: (1) Engage, (2) Explore, (3) Explain, (4) Elaborate, and (5) Evaluate. **Engagement** focuses on initiating the learning task, students should be able to make connections between past and present learning experiences as well as anticipate activities. **Exploration** provides students with a common base of experiences within which they identify and develop current concepts, processes, and skills. **Exploration** is when students are actively exploring their environment. **Elaboration** is the aspect of the model where you are able to challenge your students' learning and extend their conceptual understanding and allow further opportunities for students to practice desired skills and behaviors. **Evaluation** encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives (Bybee 8). Incorporating the inquiry model into your activities will increase the quality and effectiveness of your students' learning.

Creating a butterfly garden can provide you with opportunities to incorporate inquiry-based learning in your programs. Students are provided with a year-long experimental station where they can observe changes that occur throughout the year with plants and animals. Students can become engaged in the process of developing and creating the garden as well as the managing aspect. They are able to observe and explain animal behaviors and interactions between plants and animals. Building and sustaining a butterfly garden provides your program with endless opportunities to engage your students in hands-on activities that enhance their learning.



What is a Pollinator and Why Should I Care?

It is important to understand what a pollinator is and the importance of pollinators to our environment. When you build your butterfly garden it is necessary to understand butterflies as pollinators and their general behaviors and lifestyles.

What is a Pollinator?

One of the most important groups of pollinators is bees. Bees are the only insect that is deliberate pollinators to “bring pollen back to their offspring” (Shepherd 12). When bees are in the process of gathering pollen from different plants they “transfer pollen from flower to flower” helping in the reproduction of plants (Shepherd 13). Bees are of course not the only pollinator, flies, “birds, butterflies, and also bats, beetles and even mosquitoes are among some of the insects that help aid in pollination (Why Care About Pollinators?). Butterflies, flies, and beetles use nectar from flowers as their food source and when they are gathering food pollen transfers from the anther to their body and then as they move from flower to flower the pollen is transferred off their body to the other flowers. These pollinators are indirect pollinators because they are not purposefully collecting pollen and not all of the pollen collected gets transferred to other flowers because some of it remains on the bodies of the butterflies, flies, or beetles (Shepherd 13). Pollinators are very important in the reproduction and diversity of plants to help maintain a balanced ecosystem.

Why are Pollinators Important?

Although pollinators only help to fertilize plants so that they are able to produce flowers and fruit there are other economical and environmental impacts of pollination. Many agricultural crops are dependent upon pollinators and without them there would be a drastic decrease in the amount of “fruits and berries, alfalfa, and vegetable and flower seeds” available to the public (Shepherd 7). Plants are also essential for “medicines, dyes, beverages, and fibers” and without pollinators they would not be in existence (Shepherd 7). Pollinators are essential to plant communities. Many southwestern ecosystems are only pollinated by bees. Plants in that community maintain their health because of the bees. If the bee population decreased the plants ability to reproduce would be nonexistent (Shepherd 8).

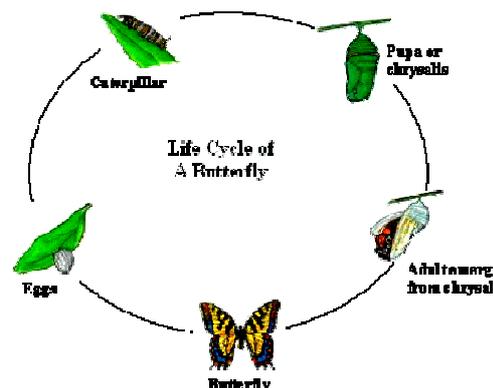
Pollinators have other beneficial impacts on plant communities. Beetle larvae that live in dead trees causes the trees to rot. Rotting and decomposing trees provide the soil with added nutrients that are now accessible to other plants (Shepherd 8). Tunneling bees help aerate soil which allows water to move throughout the soil mixing nutrients that are located in the soil (Shepherd 8). Pollinators maintain healthy plant communities.

Healthy plant communities are crucial for healthy ecosystems to exist. Plants help to prevent erosion on stream banks and help to keep river systems clean and livable for aquatic life by preventing an increase of sedimentation in their system (Shepherd 9). Many animal species, besides human, survive on plants as their food source such as herbivores and even birds and mammals, such as black bears, that eat fruit and seeds that depend on pollinators to fertilize the plant (Shepherd 9). Pollinators themselves are even sources for food for animals. Many pollinators are a primary food source for birds, spiders which also helps to maintain a stable and healthy ecosystem (Shepherd 9). By building, planting and establishing a native butterfly garden in your area you are providing another habitat for native pollinators and you help in producing a healthy plant and animal community.

Butterflies

Butterflies are one of the most loved insects mainly for their “beauty and grace” (Shepherd 31). Butterflies and moths are often easily distinguishable from one another however sometimes they are difficult to separate from one another (See **Fig.1**). Butterflies and moths belong to the insect order, Lepidoptera and generally “butterflies are brightly colored and fly by day, and moths are more likely to be colored in muted grays and browns and fly at night” (Shepherd 31). However, there are exceptions to these differences but generally this holds to be true.

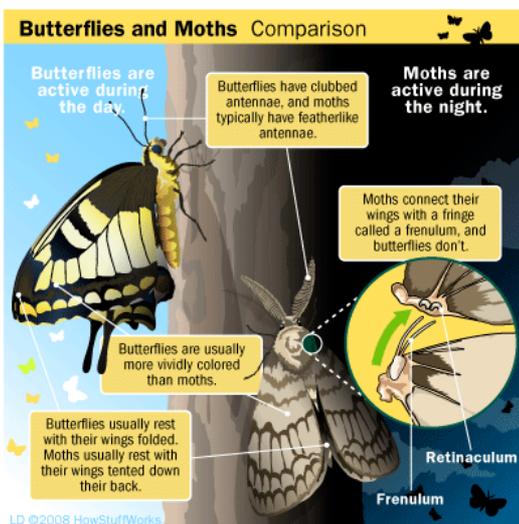
Butterflies begin their life as an egg that is “laid on or near its particular host plant species.” (Shepherd 32). A host plant species is the species of plant that the butterfly larva (caterpillar) feeds on during its time before it becomes a butterfly. Every species of butterfly has specific host plants. For example milkweed is the only host plant for the Monarch butterfly. After the egg is hatched a caterpillar is produced and spends all of its time eating and growing in order for it to turn into a chrysalis, during this time the butterfly is re-structuring and re-organizing itself into a butterfly (Shepherd 32). When the butterfly emerges from the chrysalis it spends its time collecting nectar from its adult host plant. The adult host plant for the butterfly is not the same as that species’ host plant, and can range depending on the butterfly species (Shepherd 32).



Although the nectar provides the butterflies with an appropriate amount of sugar and energy it does not supply all of the nutrients that is need for butterflies. Mineral salts are important to the butterflies’ diet and they take up the salts by sipping on muddy puddles, they also require essential amino acids and other nutrients that they receive by feeding on animal feces or carcasses.

Winter survival differs for each species of butterfly and each species uses different survival techniques to survive this period of time when the weather is not suitable for them (Shepherd 33). Many species “pass the winter in protected surroundings—like leaf litter or dense vegetation—as eggs, caterpillars, or pupae (Shepherd 33). There are some butterfly species that overwinter as adults taking shelter in “a cave, or tree cavity, under leaf litter, or among evergreen vegetation, but they will also seek winter refuge in such places as sheds and barns” (Shepherd 33). Some butterflies migrate to avoid the bad weather conditions. One of the most popular examples of this is the Monarch butterfly which flies south from as north as Canada to Mexico and California.

Fig. 1



Environmental Problems

The population of some species of butterflies and other pollinators is decreasing due to habitat loss and degradation. Pollinators play an important part in our ecosystem. It is necessary to recognize the environmental factors effecting pollinator populations and how you can prevent these environmental problems in your community.

Habitat Loss

Habitat loss is the reduction of a natural habitat making it unable to support the wildlife that lives there. Habitat loss and fragmentation is caused by urbanization, agricultural, commercial and residential development. There is a reduction in butterfly and pollinator populations because of this environmental problem. Due to the increasing human population humans are continually expanding and overtaking natural environments. "Wetlands are drained, woodlots are cut, fields are converted to parking lots or lawns" (Glassberg 28). Habitat loss impacts all plant and animal communities, especially pollinator populations. Many butterfly species are found in open fields. Many of these fields are non-existent and one of the first things to be destroyed when development occurs (Glassberg 28).

New Jersey is the most densely populated state in the United States so the impact of population growth on New Jersey's environment is severely impacted by urbanization and commercial and residential development. Habitat loss "threatens the diversity and abundance of native pollinators" (Shepherd 40). A decline in and loss of habitats causes the area to become fragmented. Fragmentation is a result of habitats becoming separated due to areas being destroyed by construction or development. The emigration and immigration of plants and animals between a habitat decreases and habitats become isolated from one another. This causes a decrease in the diversity and abundance of plant and animal species in the area. Habitat fragmentation causes a decrease in the health of a community because the diversity of plants and animals that it may have once had are now lost due to their inability to migrate between areas.

Habitat Degradation

Habitat degradation can occur due to an influx of invasive species or land management practices. Many plant and animal species are either accidentally or purposefully introduced to the United States. Some of these species do no harm and have little to no impact on the natural community interactions that occur, while other species take over and force native species out. Invasive species destroy habitats by crowding out the native plants and native pollinators, and replacing them with inferior species (Shepherd 41). Invasive species decreases the species diversity of an ecosystem and causes the overall health of the community to decrease as well.

Land management practices can also impact plant and animal communities. It has become a norm for heavily populated areas to have "only two types of habitats" which are large patches "of artificial lawns, and areas that are allowed to be 'natural' and become woodlands" (Glassberg 28). Lawns are very common through suburban areas and around corporate offices to make the surrounding seem clean and refreshing. However lawns are not suitable habitats for almost any species of butterflies. Land management brings equipment such as "modern mowers, and line trimmers" into areas to create neat lawns. As a result areas that would have been left to grow have been eliminated reducing both the floral and structural diversity" of the fields (Shepherd 41). These landscape practices dramatically destroy the habitat that was once thriving and useful and turns it into a large green space that is good for humans but nothing else.

Pesticides

Pesticides are very common with land management practices and are a huge threat to pollinators' populations across the country. "Millions of pounds of pesticides are applied to farms, fields, lawns, flower beds, and roadsides every year. Insecticides kill pollinators directly, while herbicides reduce the diversity and abundance of the flowering plants that pollinators feed upon" (Shepherd 43). Even though mass sprayings of pesticides are not heard of often, it still occurs especially for "gypsy moth infestations, mosquito control, agricultural use, and also by private homeowners" (Glassberg 30). Pesticides are often less beneficial and more harmful to the plant and animal communities. In 1970 in New Brunswick, Canada pesticides were sprayed on woodlands. Adjacent farms noticed a decline in their blueberry harvests and a decline in their native bee populations. The lack of bees was found out to be due to the pesticides that were sprayed in the woods. It took three years for the bee population to rebound and the fruit harvest to recover (Shepherd 42). As you can see the damage that pesticide can cause on a population is detrimental not only to that species but to the plants they pollinate.

What Can You Do?

Populations of pollinators if impacted in any way by habitat loss and/or fragmentation, habitat degradation, or pesticide use can not only impact the animal communities but the plant communities as well. It is important to stop these environmental problems from occurring in your community in order to protect native plant and animal populations.

- Native plants do not have to endure too much environmental stress so pesticide use should be limited
- Having nutrient rich soil will help keep your plants healthy reducing the need for pesticides
- Use natural fertilizers to keep your soil rich to prevent pesticides
- Start a compost bin – it will add nutrients to your soil naturally and reduce food waste too!
- Gardens decrease habitat fragmentation by providing wildlife a natural habitat
- Planting a variety of native plants will provide migration of animals between natural habitat areas
- Gardens will help to increase the species diversity and abundance of your community
- Native plants require little watering – reducing your maintenance costs
- Mowing less frequently will provide habitats for insects and other animals

Planting a garden in your school or afterschool community can benefit the environment and community that you live in. Gardens bring a wonderful atmosphere to your school community creating a colorful and vibrant atmosphere that adds beauty to your school landscape.

Planning for Your Site

When creating your butterfly garden it is important to pick the proper location, create the best design, and understand the management needs and budgetary costs.

Location

Your garden should be placed in a location with these four requirements in mind:

Sun Exposure

Your garden should have southern sun exposure. Your garden should receive at least 5-6 hours of sunlight a day. Butterflies use morning sunlight for basking on rocks, bricks, or gravel (The Butterfly Gardener's Guide). Plants require sun to grow so by locating your plants in an area that receives the most sun throughout the day your plants and butterflies will thrive.

Protection from High Winds

Butterflies need to be protected from intense winds in order to ensure that they are able to travel from plant to plant safely. If the location of your garden is not protected by fences or trees you need to create this shelter on the edges of your garden. You can create a shelter from prevailing winds by planting shrubs such as lilacs, mock orange shrub, butterfly bush or viburnum (The Butterfly Gardener's Guide). These shrubs are also larval and nectar plants which can help add diversity in addition to adding height and protection to your garden.

Proximity to Other Plants

As discussed earlier, patches are created due to urbanization, commercial, and residential development. It is important to place your garden not only in a sunny, warm, and sheltered location but also close to other gardens or plants. Butterflies will be more likely to visit your garden if there are other nectar or larval plants nearby (Roth 41).

Access to Water

Part of the management practices you will need to do for your garden is watering your garden. Although many of the plants you will be planting are native to New Jersey's climate, it is still necessary to have a close water source. A water source could be a sprinkler system or hose hookup that is near your garden. By locating your garden near a water source it will diminish the amount of labor needed to put in to maintaining the health of your garden.

By having your garden in a sunny and warm location, close to a water source, sheltered from winds and close to other gardens and plants will increase your chances of attracting butterflies to your garden, and maintaining your garden and your butterflies' health and vitality.

Garden Design

Size

The size of your butterfly garden can be anywhere from part of your school's flower bed to as large of garden as you have space for you in your school yard. Even if you do not have a lawn surface that you are able to use or your school or program only has blacktop surfaces you can plant your garden in containers.

Elements

Soil

The plants you will be choosing are native to New Jersey so the type of soil should not be that different than what you have. It is important that your soil be aerated and does not have any sod within it (Roth 33). The soil should be rich and loose. You can “dig in some aged manure or composed to make your worms happy and your plants thrive” (Roth 33). If you feel that your soil may have toxic chemicals in it you can get your soil tested for free from Rutgers University (see resources page for information)

Plants

Your garden should contain both **host** and **nectar** plants.

Host Plant – plant where eggs are laid on and larvae use as their food source. For example, Monarch butterfly larvae will only eat milkweed.

Nectar plant – provides rich sources of food for adult butterflies.

Areas

Your butterfly garden should contain the following areas:

1. Rock/Pebble Area

Butterflies use the rock and pebble area to bask in the sun and warm their bodies and dry their wings (Roth 60).

2. Patches of Plants

Create patches of plants that vary in color, height, and blooming periods. You should plant 3 to 5 plants of each species in your garden. This will create patches and clumps of plants on its' own attracting more diverse butterflies to your garden (Shepherd, M, et al 20).

3. Puddle Area

Butterflies need water and creating spots in your garden is necessary to attracting different species of butterflies as well as more butterflies (Roth 54). One way to create a water source for your garden is by creating a man-made puddle by putting a saucer filled with pebbles and placing this in a shady spot so that the water is not quickly evaporated (Roth 60). The saucer would then be filled almost to the top of the pebbles, but allowing the pebble surfaces to be dry which would allow the butterflies to sit on a dry surface while drinking (Roth 60). By having the stones in a saucer, such as a clay pot saucer, and putting it in a shaded area reduces the amount of time you need to continue to re-fill the saucer with water.

A mud puddle is another way to produce a water source for butterflies. You can create a mud puddle in your garden by having an exposed dirt layer in a semi-shaded area damped with water. The mud adds additional nutrients and salt to the water that the butterflies need (Roth 61). Butterflies will often gather in large groups at sources of water so it's important to make sure that your water source is constant.

4. Grassy Area

Some butterfly species use the weedy and grassy patches to lay their eggs (Roth 100). By adding some wood debris you can create shelter for butterfly eggs and/or caterpillars. Patches of grass, weeds, and woody debris allows protection for certain species of butterfly eggs and/or caterpillars that hibernate during the winter (Shepherd, M, et al).

Garden layout

Container Garden

If you are unable to use the lawn at your school or program or you have only blacktop surfaces you can use containers to build your garden. You can purchase containers at your local garden or hardware stores or even see if community members could donate them to your school or program. You can rearrange the containers on the outdoor surfaces that you have. You can even use reusable shopping bags that you get from grocery stores to grow your plants in (see right). Remember diversity is important to your garden, have each container grow different plants in order to attract a variety of wildlife to your garden.



Other Sites

Be creative with the space that is available to you! Remember the key to butterfly gardens is having a variety of plants but having at least 2 to 3 plants of each species. Make sure to include host and nectar sources for butterflies so your children will not only see the butterflies feed but also grow and complete their life cycle. For larger spaces consider placing benches so that your children can sit and observe the garden. Look online or the suggested books for additional ideas on how to plan your site.



Plant Species

Common Name	Scientific Name	Plant Type	Height	Flower Color	Blooming Period	Butterflies Attracted
Butterfly Bush	<i>Buddleia davidii</i>	Shrub	Up to 6'	Purple, Pink	Summer-Fall	Eastern Tiger Swallowtail, Mourning Cloak, Red Admiral, Monarch
Common Milkweed*	<i>Asclepias syriaca</i>	Annual	3 - 6'	Pink	Summer	Eastern Tiger Swallowtail, Clouded Sulphur, Spring Azure, Mourning Cloak, Red Admiral, Viceroy, Monarch, Silver-Spotted Skipper
Swamp Milkweed*	<i>Asclepias purpurascens</i>	Annual	2 - 3'	Magenta	Summer	
Butterfly Milkweed*	<i>Asclepias tuberosa</i>	Annual	1 - 3'	Orange	Summer	
Purple Cone Flower	<i>Echinacea purpurea</i>	Perennial	2 - 5'	Purple	Summer-Fall	Eastern Tiger Swallowtail, Viceroy, Silver-Spotted Skipper
Black-eyed Susans	<i>Rudbeckia hirta</i>	Perennial	1 - 3'	Yellow	Summer-Fall	Monarch
Joe-Pye Weeds	<i>Eupatorium spp.</i>	Perennial	2 - 7'	Purple	Summer-Fall	Viceroy, Monarch, Silver-Spotted Skipper
Asters	<i>Symphotrichum spp.</i>	Perennial	½ - 7'	Purple or White	Summer-Fall	Cabbage White, Clouded Sulphur, Red Admiral, Monarch, Eastern Tiger Swallowtail, Skippers
Goldenrod	<i>Solidago spp.</i>	Perennial	½ - 7'	Yellow	Summer-Fall	Clouded Sulphur, Viceroy, Monarch
Bee-balm	<i>Monarda didyma</i>	Perennial	2 - 5'	Red	Summer-Fall	Eastern Tiger Swallowtail, Cabbage White
Wild Bergamot	<i>Monarda fistulosa</i>	Perennial	1 ½ - 4'	Pink	Summer-Fall	
Lilac	<i>Syringa vulgaris</i>	Shrub	Up to 10'	Purple or White	Spring-Summer	Eastern Tiger Swallowtail, Spring Azure
Sweet Pepperbush	<i>Clethra alnifolia</i>	Shrub	Up to 10'	Pale Pink or White	Summer	Red Admiral, Eastern Tiger Swallowtail, Silver Spotted Skipper
Nasturtium*	<i>Tropaeolum majus</i>	Annual	1'	Yellow, Orange, Red	Summer-Fall	Cabbage White
Lantana	<i>Lantana spp.</i>	Shrub	1 - 6'	Red, Orange, Yellow, Blue, White, Pink	Summer	Skippers, Swallowtails, Cabbage White, Monarch
Fennel*	<i>Foeniculum vulgare</i>	Perennial	Up to 8'	Yellow	Summer	Black swallowtail
Dill*	<i>Anethum graveolens</i>	Herb	Up to 3'	White, Yellow	Summer	Black swallowtail
Parsley*	<i>Petroselinum crispum</i>	Herb	Up to 2'	Green, White	Summer	Black swallowtail

*Indicates that this is a host plant for a butterfly species

Butterfly Species

The following section is an overview of the type of butterfly species that you will likely find in your butterfly garden. These butterflies are found all throughout New Jersey and the plants that are suggested for planting should help to attract them to your garden. Each section has a picture of the butterfly and caterpillar, its range, habitat, occurrence, caterpillar host plant and any other comments descriptions to distinguish each species.

Eastern Tiger Swallowtail

Papilio glaucus



Dorsal Female



Caterpillar

Family: Papilionidae

Range: Southern Canada to southern Florida and Texas; including all of New Jersey

Habitat: Diverse and widespread.

Occurrence: Three broods April – September. Peaks in early May, June and August.

Caterpillar Host Plants: Wild Black Cherry (*Prunus serotina*), Ash (*Fraxinus spp.*), Lilac (*Syringa vulgaris*), Tulip Tree (*Liriodendron tulipifera*).

Nectar Plants: Butterfly bush, milkweed, purple cone flower, golden rod, black eyed susans, etc.

Males versus Females: Females are distinguished from males by the extensive blue on the dorsal hind wing.

Cabbage White *Pieris rapae*



Ventral



Caterpillar

Family: Pieridae

Subfamily: Pierinae

Range: Central Main to central Florida; including all of New Jersey and west across the continent into northern Mexico.

Habitat: Found everywhere except in forests.

Occurrence: Continuous broods overlapping March-November.

Caterpillar Host Plants: Mustards, Wild Peppergrass (*Lepidium*), often on Nasturtium (*Pavulaan*), on crops such as cabbage, broccoli, cauliflower, radish, collards, kale, and Water Cress.

Nectar Plants: Butterfly bush, asters, zinnias, clover, lantana, etc.

Clouded Sulphur *Colias philodice*



Male Ventral



©Dave Wagner, 2002

Caterpillar

Family: Pieridae

Subfamily: Coliadinae

Range: Canada to central George and west to the Pacific Coast and south to Guatemala; including all of New Jersey.

Habitat: Very diverse. Greatest abundance over fields of clover and alfalfa.

Occurrence: Up to four broods March to November.

Caterpillar Host Plants: White Clover (*Trifolium repens*), Red Clover (*Trifolium pretense*), Alfalfa (*Medicago sativa*).

Nectar Plants: Butterfly bush, purple cone flower,

Comment: Often confused with Cabbage Whites.

Monarch

Danaus plexippus



Ventral



Caterpillar

Range: Widespread

Habitat: Open areas, gardens, meadows, fields, dunes.

Occurrence: One to four asynchronous broods. Migrants appear in March to May.

Caterpillar Host Plants: Milkweeds (*Asclepias*)

Nectar Plants: Milkweed, Black-eyed Susans, Goldenrod, Lantana, Asters, Butterfly Bush, etc.

Males versus Females: Males are distinguished from females by noticing two visible black spots on their hind wings.

Interesting Facts:

Monarch butterflies migrate. In the Spring Monarchs migrate from Mexico up to the West and East coasts. In the Summer Monarchs migrate up to Canada, laying their eggs on milkweed plants as they travel and die along the way. They spread northward over two or three generations. In the Fall Monarchs migrate back to Mexico to avoid the winter inclement weather.



Management Needs

When to Plant

Planting your butterfly garden will depend on the weather and if the ground is warm enough to dig (Shepherd, M, et al 84). If you are planning your butterfly garden in containers you should place your containers outside after the last frost. Since you will be planting native plants they should be adapted to New Jersey's weather conditions you can ask your local nursery or garden book to when the best time to plant in New Jersey would be (Shepherd, M et al. 84).

Maintenance

Planting native New Jersey plants in your schoolyard habitat will help to “reduce the need for irrigation, minimize maintenance, avoid costly replacement, and get the best results from your efforts” (Shepherd, M, et al 84). Watering and weeding is a must to maintain the butterfly garden in your school. It is important to “deeply [water your garden] once a week until the roots are well established” (Pollinators Handbook 84). Each plant will vary in the amount of time it will take for them to have their roots established, you should consult either the seed package or label on the plant when you purchase them. The best tip for watering your garden is to get a drip hose or soaker hose which allows water to be distributed throughout your garden to provide water “at the root level” to your plants (Shepherd, M, et al 85). Drip hoses or soaker hoses reduce the cost of watering your garden because it effectively waters your plants.

Weeding your butterfly garden is important to help nectar and larval food plants receive the resources they need to grow. However not all weeds are bad, many “weeds” that we are normally used to calling some plants are good for your butterfly garden. It is important for your garden to have some grassy or “weedy” areas where butterflies or caterpillars can be protected from predators. It is important that your garden have native plants so that the diversity of your plant community will not be reduced (Shepherd, M, et al 86). You can de-weed your garden either by removing the weeds by hand. You can also get rid of unwanted plants by not watering your garden more than once a week, because the weeds are most likely going to be “shallowly rooted annuals...the soil surface [will dry] out between watering and weeds are less able to survive” (Shepherd, M, et al 86). Another way to help to prevent weeds is to mulch the first year of planting (Shepherd, M, et al 86). Mulching will also help create protective areas for your butterflies and caterpillars.

Habitat Management

You are creating a habitat for butterflies and other pollinators in your area. As discussed earlier it is important to create these small habitats to help increase biodiversity in your area. Long-term management needs is important for maintaining your butterfly garden over the years. With your perennial plants you can maintain their life by “removing the dead flowers [which] will encourage more blooming” (Shepherd, M, et al 87). Keeping dead growth on your plants over the winter is important to help provide shelter for overwintering butterflies; the dead growth can then be cut or trimmed in the spring before the plants bloom (Pollinators Handbook 87). As for the annual plants you will have planted you can replenish the seeds by re-seeding yearly for those plants (Roth 33).

Budget and Grants

Budget

Buying already grown plants and shrubs can be expensive for your butterfly garden. However for the annual plants you will be planting buying and planting seeds is your easiest and cheapest option. You can buy their seeds and scatter them throughout your garden. While some of the shrubs such as the lilac will have to be purchased from your local nursery or garden center.

See the “Buyer’s Guide” for places to purchase seeds and plants or where to look for donations.

Grants

Grants can become available for starting and maintaining your school yard habitat. Some grants do not support the purchase of seeds or soil but they can help you purchase some yearly maintenance garden supplies to help begin your school yard habitat.

Kids Gardening

This organization has a list of grants that are currently available for building a garden in your community. Their website also offers a **free newsletter** for educators to receive more information on gardening, lesson plans, etc!

Visit www.kidsgardening.org/grants for a list of current grants available!

National Gardening Association

Offers yearly grants to eligible youth group organizations. The 2010 grants are fulfilled but you can get started to find out more information about the 2011 grants that they offer. This website also lists other grants that are available for gardening projects.

Visit <http://assoc.garden.org/grants/> for more information!

Buying Guide

Native Plant Nurseries

D&R Greenway Native Plant Nursery

1 Preservation Place
Princeton, NJ 08540
Phone: 609.924.4646 Fax: 609.924.5577
Web: <http://drgreenway.org>

Toadshade Wildflower Farm

53 Everittstown Rd.
Frenchtown, NJ 08825
Fax: 908.996.7500
Email: toadshad@toadshade.com Web: www.toadshade.com
Retail; primarily online and mail orders

Wild Earth Native Plant Nursery

1005 Farmingdale Road
Freehold, NJ 07728
Phone & Fax: 732.308.9777
Web: wildearthnbn@compuserve.com

Online Plant Distributors

Annie's Annuals and Perennials

<http://www.anniesannuals.com/>

Bowman's Hill Wild Flower Preserve

<http://www.bhwp.org>
1635 River Road
New Hope, PA 18938
Phone: 215.862.2924
Retail: mail order seeds and fall/spring plant sales

Vermont Wildflower Farm

<http://www.vermontwildflowerfarm.com>

Garden Soil and Bagged Compost Donations

Approach your local Loews, Home Depot or Garden Center. Request donations of garden soil and/or compost – they will readily donate problem bags. (**Hint:** Bring duct tape to seal ripped bags!)

Plant Donations

Contact your local Garden Club for plant donations in the spring. Their members often split their plants and share with other members. Many of them would gladly share their plants with your program.

Observing a Butterfly's Life Cycle

Grades: K-2

NJCCCS: 1.3.2.D.1; 1.3.2.D.5; 5.3.2.D.2; 3.1.2.F; 3.1.2.G; 1.3.2.B.6

Objective: Students will be able to identify the characteristics of the life cycle of a butterfly

Length: 30 minutes with 30 days of observation

Procedure

Pre-Planning

- Observe your butterfly garden for butterfly eggs (not larvae) or you could order a butterfly kit from a variety of businesses and science supply stores.
- You will need a copy of the book *The Very Hungry Caterpillar* by Eric Carle
- Print out an image of a caterpillar

Engage

Using the print out of the caterpillar, ask your students if they know what it is. As a class or small groups have students describe a caterpillar. Use paper to record the ideas that students come up with.

Explore

Students will observe the development of a butterfly first-hand. Students will make daily observations of the development of the butterflies in their field journals, paying careful attention to the butterfly's size, color, shape, activity, and diet. Encourage students' observations to consist of words, pictures, or illustrations.

Explain

Read *The Very Hungry Caterpillar* to the class. As soon as the story is finished, look back through the book and ask children to think about how the caterpillar changes in the story. Have students talk about why the butterfly's appearance changes through its life cycle. Have students list (or draw) in their science journals the ways in which the "very hungry caterpillar" changed during the course of the story. Encourage them to use the following terms: Egg, larva or caterpillar, pupa or chrysalis, adult butterfly. Have students go back to their original responses to what a caterpillar is to determine which of the statements represent facts that they observed during their own observations of a butterfly's life cycle.

Elaborate

In groups students can demonstrate the life cycle of the butterfly. Students can choose from drawing a diagram, acting out, creating a song or writing a poem about the life cycle of a butterfly.

Evaluate

Bind the students' journal pages into a class journal. Students can create butterfly shaped covers by taking 11 x 17 inch construction paper, folding it over, and cutting an outline of a butterfly's wing. They can then decorate their butterflies to create their own covers. The bound journal pages can be inserted into their butterfly cover. Students can each present their journal page to the rest of the class.

Extension

- In the spring your program can throw a birthday party for the Earth. If you choose to raise your own butterflies you can end your birthday party with a release of the raised butterflies into the garden you have built.
- Magic School Bus has an extension activity that you can use to follow up - <http://bit.ly/b1qFJD>
- Students can compare their own development from an infant to that of a butterfly

A Butterfly's Home: Creating a Butterfly Garden

Grades: K-6

NJCCCS:

Objective: To determine which environmental characteristics make up a favorable butterfly habitat

Length: 2 hours

Materials

- Magazines, garden images
- Small objects to use for a collage (beans, pasta, cotton balls, fabric, etc.)
- Glue, crayons, markers, colored pencils, etc.
- Illustrated book on butterflies or other resources such as videos and other gardening books, or access to internet.

Procedure

Pre-Planning

Collect all materials ahead of time for students to use. Find a book on butterflies from your local library. The book used in this lesson is *Where the Butterflies Grow*, by Joanne Ryder

Engage

Read *Where the Butterflies Grow*, by Joanne Ryder to the class. Have students discuss as a group what types of things butterflies would need in their environment. For older students you can show a video on butterflies.

Explore

Have students work in groups to research how they would design their butterfly garden. Have students keep in mind the following questions: What are the four basic elements of wildlife habitat? (food, water, shelter, place to raise young); What do butterflies eat?; Where do they rest?; Where do they get water?; Do we know what types of butterflies are found in our area? If not, where can we find out?; What types of things, other than just plants, should be in a butterfly garden? Students should use the available resources they have to research these questions in order to design their garden.

Explain

Students will work within their groups or individually using magazines, computer images, photographs they have taken themselves, collage objects to create a 3-D collage of the types of plants and materials that should be in a butterfly garden. Older students can research the specific host and nectar plants for each species of butterfly to include in their garden, they can use a computer to print out images or if your garden is already created they can take pictures of the plants you have.

Elaborate

Have students present their gardens to the group. Students should answer the following questions when they present: Why is this a good habitat for a butterfly?; Can you think of something that we would not want to add to the garden? Why? ; Would it be good for other insects or animals? What types and why? ; How does your garden resemble the garden that you saw in the story or in the video clips?

Evaluate

Have students describe an "ideal" butterfly environment. They can either draw this habitat and label the things in their drawing that help the butterfly survive or thrive OR they can write a paragraph about what an "ideal" butterfly habitat would look like.

Extension

Students could be part of the process of building and creating a butterfly garden in your program. Students who are good with math can design a plan for what the garden should look like – using dimensions of your garden plot. Students can suggest plants that you should add to the garden based on their own research of what makes an ideal butterfly garden.

Lesson adapted from Science NetLinks Lesson Plan: Butterfly 2: A Butterfly's Home

Other Lesson Plan Suggestions

Websites

- **MonarchLive** - <http://monarch.pwnet.org/trc/plans.php>
 - Offers lesson plans for K-12
- **Monarchs in the Classroom** - <http://tiny.cc/h2qcw>
 - Offers samples of their curriculum for grades K-12
- **National Wildlife Foundation Backyard Habitat** - <http://bit.ly/9fa8Lb>
 - Provides in-depth lesson plans with both teacher and student pages

Other Suggestions

- Actively involve your students in the design and creation of your garden.
- Have students write a poem or story about a butterfly
- Create science journals where students can write what they observe in the garden
- Create a plan to help solve an environmental problem in your community – have students present this plan to their community officials.
- Learn the structure of plants by dissecting flowers
- Create your own plant ID books – take pictures or draw the plants in the garden
- Have students calculate the species diversity of your garden

Suggested Curriculum Guides

Monarchs in the Classroom: *An Inquiry-Based Curriculum* by Monarchs in the Class

- Three separate curriculums for K-2, 3-6, and Middle School
- Includes extensive background information on Monarch biology
- Lessons include teacher and student pages focused on life cycle, migration, ecology, systematic, experiments, and conservation
- Found at www.monarchlab.org

Schoolyard Ecology Explorations: *An Inquiry-Based Curriculum* by Schoolyard Ecology Explorations, Monarchs in the Class

- Includes descriptions of how to use the curriculum, how to teach outdoors, and using inquiry
- Provides over 40 lesson plans from developing scientific experiments to discovering about biodiversity
- Each lesson includes detailed information from objectives, key concepts, skills, handouts, extensions, etc.
- Found at www.monarchlab.org

Project Learning Tree® *Environmental Education Activity Guide* , American Forest Foundation

- Offers a variety of environmental education activities that you can incorporate with your butterfly garden and within your program
- To receive this curriculum you must attend a Project Learning Tree workshop – look at www.plt.org for workshops near you!

Resources

Field Guides

- Butterflies through Binoculars: The East by Jeffery Blassberg, 1999
- Caterpillars of Easter North America by David L. Wagner, 2005
- Wildflowers in the Field and Forest: A field guide to the Northeastern United States by Steven Clemants and Carol Gracie, 2006

Books

- Attracting Butterflies and Hummingbirds to Your Backyard by Sally Roth, 2002
- Butterflies of New Jersey: A guide to their status, distribution, conservation, and appreciation by Michael Gochfield and Joanna Burger, 1997
- Pollinator Conservation Handbook by Matthew Sheperd, et al, 2003
- The Butterfly Gardener's Guide by Brooklyn Botanic Garden, 2003

Websites

- **Backyard Wildlife Habitat** – <http://www.nwf.org/Get-Outside/Be-Out-There.aspx>
 - Provides activities, resources, etc for getting kids outside!
- **Butterflies' Host and Nectar Preferences** - http://www.baylink.org/host_nec.html
 - List of butterflies and their preference for host and nectar plants
- **Journey North Monarch Butterfly** – www.learner.org/jnorth
 - Offers information about monarchs and their migration, lesson plans, etc.
- **Kids Gardening** - www.kidsgardening.org
 - Offers grant information, free newsletters, gardening tips, resources, etc.
- **Lady Bird Johnson Wildflower Center** – www.wildflower.org
 - Features plant database, resources for teachers, native nursery locator, etc.
- **Monarch Watch** – www.monarchwatch.org
 - Offers resources, lesson plans, and information about monarchs
- **Monarch Lab** - <http://www.monarchlab.org/Lab/>
 - Offers information and resources to caring for monarchs in your classroom.
- **National Gardening Association** – www.garden.org
 - Offers grant information, resources, calculators, etc.

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- Shepherd, M, et al. Pollinator Conservation Handbook. The Xerces Society, Portland, Oregon. 2003.
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- "Why Care About Pollinators?" Nature's Pollinators Pollinators, Plants, and You. 2007. The Pollinator Partnership. 6 Apr. 2009 <<http://www.nappc.org/curriculum/intro.php>>.

Photograph Credits

- <http://static.howstuffworks.com/gif/butterfly-moth-comparison.gif> (Moth vs. Butterfly)
- <http://www.glogster.com/media/2/5/91/72/5917203.gif> (Butterfly Life Cycle)
- [Eastern Tiger Swallowtail Papilio glaucus Wings 2908px.jpg](http://www.glogster.com/media/2/5/91/72/5917203.gif) (Eastern Tiger Swallowtail - Butterfly)
- http://1.bp.blogspot.com/_n4ztllfSEfw/RppKiHjMkpl/AAAAAAAAAbA/8unuknTac7Q/s400/DSC_0002-July-15.jpg (Eastern Tiger Swallowtail-Caterpillar)
- http://upload.wikimedia.org/wikipedia/commons/7/7f/Small_white_feeding_on_thistle_flower.jpg (Cabbage White -Butterfly)
- <http://upload.wikimedia.org/wikipedia/commons/b/b4/Pieris.rapae.caterpillar.jpg> (Cabbage White - Caterpillar)
- http://upload.wikimedia.org/wikipedia/commons/d/d3/Male_Clouded_Sulphur%2C_Megan_McCarthy56.jpg (Clouded Sulphur - Butterfly)
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