Longwood Gardens

Meadow Garden

Volunteer

Manual

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Contributing Staff and Volunteers:

Nancy Bowley, Docent Coordinator & project leader

Tom Brightman, Land Steward

Paula Butera-Kunkel, Guest Engagement Lead/Supervisor of Webb Farmhouse Volunteers

Bill Haldeman, Natural Lands Manager

Colin McCallum- Cook, Meadow Gardener

John Mercer – West Chester Bird Club

Bluebird Volunteer Team

Birding Volunteer team

Meadow Wildflower Bloom Log Team

This manual reviewed by the following:

Nancy Bowley, Docent Coordinator

Tom Brightman, Land Steward

Paula Butera- Kunkel, Guest Engagement Lead/Supervisor of Webb Farmhouse Volunteers

Colin, McCallum- Cook, Meadow Gardener

Additional Editing by Trish Evans, Dottie Miles, Marketing and Interpretation staff

Sources:

Longwood's Landscape Evolution, Dec 2010

Interpretive Plan and Materials created for Meadow Garden Interpretation written by Gecko, Dottie Miles and consultants (Beverly Sheppard)

Notes from Moira Sheridan Interviews with Tom Brightman

Notes from Soil to Sky Documents – Horticulture team

Dragonflies and Damselflies in the Waterlily Display Document, Will Prost

Bringing Nature Home: How You Can Sustain Wildlife with Native Plants. Tallamy, Douglas W., Timber Press, 2009.

North Creek Nursery; http://www.northcreeknurseries.com/index.cfm/fuseaction/home.home/index.htm

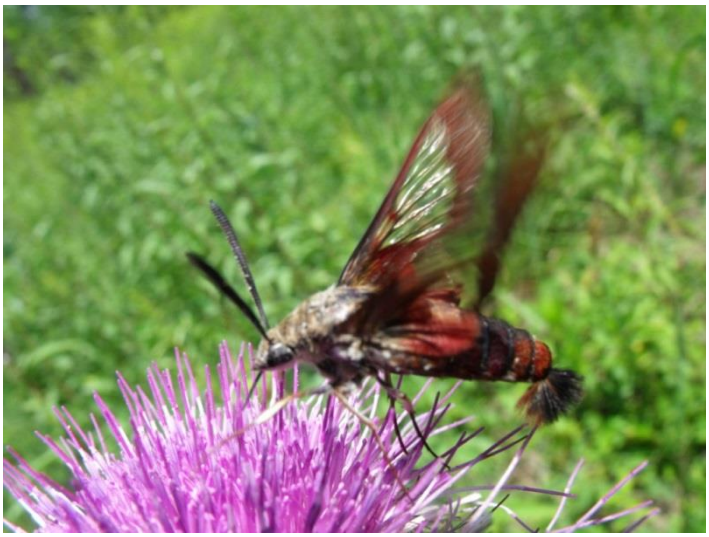
Common and Noteworthy Meadow Garden Pollinators

1. Monarch Butterfly (*Danaus plexippus*)

Credit: Colin McCallum-Cook

This distinctive, handsome butterfly is widely loved and recognized. While the adults will nectar off of a wide variety of plants, the caterpillars feed only on milkweeds, which are poisonous to most insects. The cardenolides in the milkweed sap will confer lifelong chemical protection for the Monarch (even as an adult), but this plant specialization has made the species highly vulnerable to the loss of milkweed habitat to industrialized agriculture. Before the advent of herbicide resistant GMOs, which have allowed for whole-field herbicide application, milkweeds flourished between rows of corn and soy beans. A migratory species, the monarch's overwintering grounds in Mexico (a single site—the 56,000 hectare Mariposa Monarca Biosphere Preserve) are also being threatened by illegal logging and habitat degradation. Encourage guests to plant milkweeds in their gardens to help us save this declining species.

2. Hummingbird Clearwing Moth (*Hemaris thysbe*)



Credit Colin McCallum-Cook

A hummingbird mimic both in appearance and behavior, this energetic moth can be seen hover-feeding from various flowers from early July through August throughout the heat of the day. Like most sphinx moths, *H. thysbe* (as well as their smaller cousins, *Hemaris diffinis*—the yellow-colored Snowberry Clearwing) have long proboscises that allow them to suck nectar from mid-air. While sphinx moths can resemble skippers, the best way to tell a butterfly apart from a moth is to look at the antennae. While butterflies tend to have club-shaped antennae, moths tend to have feathery or stick-like antennae (as does *H. thysbe* and *H. diffinis*)

Common and Noteworthy Meadow Garden Pollinators

3. Flower Flies (*Syrphidae* species)

Commonly mistaken for sweat bees, these flies (like all flies) can be identified by their single pair of wings and comically oversized eyes. Unlike sweat bees (*Hallictidae* species), Syrphids are harmless to people—although their larvae prey on many pest insects, making them useful for bio-control. Most Syrphids are generalist pollinators, but have been found to prefer white and yellow-colored flowers

Source: Francis C. Franklin, Wikipedia Commons

4. Great Spangled Fritillary (*Speyeria cybele*)

A brush-footed butterfly, the great spangled fritillary feeds on a wide variety of nectar-rich flowers, including *Asclepias tuberosa* (butterfly milkweed), *Monarda fisulosa*, and various thistle species. Its caterpillars subsist entirely on violets species, which proliferate following periods of disturbance (such as prescribed fire) that maintains their meadow habitat. Like other brush-footed butterflies, the front two legs of *S. cybele* are highly modified, allowing them to "taste" things that they land on with their feet.

Credit: Colin McCallum-Cook

Common and Noteworthy Meadow Garden Pollinators

5. Ruby-Throated Hummingbird (*Archilochus colubris*)

Credit: Colin McCallum-Cook

Our only Eastern hummingbird, this migratory species overwinters in Central and South America before arriving in early summer. As these tiny birds have the one of the highest metabolic rates of any animal (with heart rates up to 1260 beats-per-minute), they are constantly only a few hours away from starvation. It is unknown how *A. colubris* is able to fly over the Gulf of Mexico (a 20 hour, non-stop flight) during its annual migration, even after doubling their fat mass prior to the journey. Hummingbirds can be seen frequenting brightly-colored, tube-shaped flowers throughout Longwood. They are particularly attracted to orange and red colored species, including *Monarda didyma* (bee balm) and *Lornica sempervirens(trumpet honeysuckle)*

6. Tumbling Flower Beetles (*Mordellidae* species)

Source: Didier Descouens, Wikipedia commons

Named for the way that they tend to tumble-about in insect nets, these clumsy fliers feed off of wide-cupped flowers of the Magnolia family.

Although *Morellids* (like most beetles) are not prolific pollinators, they will often get themselves covered in pollen as they wallow about in flowers, which they can transfer to other plants. There are over 1500 species, but most can be identified by their elongated abdomens and clumsy, slapstick antics.

Common and Noteworthy Meadow Garden Pollinators

7. Mason Bee (*Osmia* species)

These solitary native bees are active in the early Spring, feeding off of the first nectar flows from redbud, shadbush, and other flowering trees in March/April. They are thrifty insects, and will lay their larva in any suitable existing cavity—including hollow stems (typically Joe-Pye weed), bored wood, or even empty snail shells. The female will spend the spring gathering pollen and nectar to provision the nest before sealing it with mud. Their stings are rare and mild.

Source: Beatriz Moisset, Wikipedia Commons

8. Eastern Yellow Jacket Wasp (*Vespula maculifrons*)

Although their stings can be painful, these ground-dwelling native wasps are important pollinators of many meadow flowers.

The adults subsist entirely on sugary liquids such as nectar, but are also attracted to rotting fruit, soft drinks, and honey.

Source: Beatriz Moisset, Wikipedia Commons

Common and Noteworthy Meadow Garden Pollinators

9. Silver Spotted Skipper (*Epargyreus clarus*)

Credit: Colin McCallum-Cook

Our most widely-recognized skipper, these charismatic butterflies are often seen zipping around at high speed as they forage for nectar from a wide variety of meadow flowers.

Oddly enough, the adults are almost never seen feeding on yellow colored flowers. They are particularly fond of pink and purple flowers such as *Monarda fistulosa*, *Liatris spicata*, and various thistle species.

10. Goldenrod Soldier Beetle / Pennsylvania Leatherwing (*Chauliognathus pensylvanicus*)

Source: D. Gordon E. Robertson, Wikipedia commons

During the late summer and early fall, large numbers of soldier beetles can be found feeding on the pollen and nectar of various goldenrod species.

C. pensylvanicus is the most common species of this large family of beetles, which are closely related to the lightening bugs (which they are thought to mimic). The missing "n" in "pensylvanicus" is characteristic of the spelling conventions of its namesake state at the time of its description (1774) by Charles de Geer.

- Colin McCallum-Cook

Bluebirds and Bluebird Nest Boxes

A healthy and varied habitat, like our meadow, provides food for numerous bird species. By managing the Meadow Garden for a larger diversity of plant and insect species, we ensure a thriving bird population. Longwood has collected over 30 years of bird inventories and nest box fledging results.

Our year-round monitoring and stewardship of bluebirds helps to increase the population of this species. We have been designing, building, placing, and caring for bluebird boxes around the property for over 30 years as part of our commitment to land stewardship. Our team of bluebird volunteers monitors our approximately 200 boxes around the property throughout the nesting season. We usually fledge an average of 200-250 young bluebirds every year along with numerous tree swallows, chickadees, and wrens.

Meadow Garden Bluebird Boxes

The Meadow Garden has approximately 40 boxes along it path. Because of the long history of bluebird recovery efforts, this garden shows several evolutions of box design. Our current field box is the box with the slanted roof and a black shingle. But, you can also find our Green Roof Box in the Meadow Garden (as sold in the Garden Shop).

Bluebird nesting habits

In the spring and summer, bluebirds require nesting cavities in which to build a nest and raise their young. Breeding begins in mid-March to early April, as soon as the weather breaks, and lasts until mid-August. The Eastern bluebird constructs its nest like a loosely built cup, in a cavity of dry grass or pine needles. The bluebird lines the nest with finer grasses. Although both the female and male bluebird participates, the female does most of the nest building.

Once the nest is complete, the female bluebird typically lays from three to five sky blue eggs. She lays one egg per day. The total number of eggs laid by the female bluebird at one time is called a clutch. The nestlings that hatch from a single clutch of eggs are called a brood. Female bluebirds typically have two broods per nesting season. The female incubates the eggs over a fourteen-day period.

Bluebirds build a new nest for each brood.

Feeding the new hatchlings

Once the nestlings have hatched, both parents participate in feeding them. Nestlings are fed every 20 minutes for 15 to 18 hours each day. It takes about 1000 pounds of insects to feed one clutch of bluebirds. Their diet is mostly soft insects, grubs, small beetles, and occasionally ripe berries. The nestlings' eyes open four to six days after hatching. As fledging time approaches, the parents may feed the chicks large quantities of insects from dawn to darkness.

Nestlings become fledglings when their wings have developed enough to allow the birds to fly. Fledglings leave the nest about 15-18 days after hatching. After leaving the nest, fledglings become juveniles.

Bluebirds and Bluebird Nest Boxes

The male bluebird will tend to the juveniles as the female re-nests. Bluebirds build a new nest for each brood.

As long as there is food available, bluebirds may stay in this vicinity (Kennett Square, PA) all winter feeding mainly on wild berries. You may see several of them using the birdhouse as a shelter and a place to keep each other warm during very cold or stormy weather.

Design

This bluebird house was designed by Longwood volunteers to protect bluebirds from predators, to protect them in the heat and to facilitate cleaning and maintenance. This design has evolved over thirty years from a basic 5”x5”x5” cube to the present design.

Past volunteer Warren Lauder used his expertise to design the original Longwood bluebird house. Lauder observed that high interior nest box temperatures of other nest box designs were possibly killing young birds and embryos in the eggs. Lauder enlisted the aid of an engineer at the DuPont Company and with his help, designed his nest box so that the internal temperature is the same as the outside air temperature. To achieve this, the corners of the nest box floor are cut off allowing air to enter through the floor. It has been continually refined ever since to suit bluebird health and safety.

The present design includes the following features:

- Overhanging roof line for rain protection along with longer side sections which allow water to drip off the house rather than collect.
- Side vent holes and a front slot allow air flow to keep the interior cool on hot days
- A taller house protects the young from predators
- Black shingle/green roof insulate and protect young from high temperatures.
- Unpainted finish. Paints and stains can be toxic to the birds; let the birdhouse “weather” naturally.
- Green Roof houses are planted with a mix of hardy sedums.

Box Location

The location of a bluebird house is important. It is best to mount it on an eight foot steel post about five feet above the ground. Mounting it on a tree or fence makes it accessible to predators like cats, squirrels and raccoons, and should be avoided. It should be in an open, grassy area not close to shrubs or small trees, which attract wrens. Ideally, it should face south or east, away from prevailing winds/storms, but this is not critical. It is also helpful to have it face shrubs or trees so that the fledglings have a target for their first flight. In the Meadow Garden, the location of trails has influenced the bird house sites.

Remember, the blue bird house is only a nesting box. Once the babies fledge, the box will not be used until another family is ready to nest.

Bluebirds and Bluebird Nest Boxes

Bluebird Monitoring

Opening the house periodically for monitoring will not bother the birds. We monitor each box regularly, typically on a one to two week schedule. This allows us to keep accurate counts, perform maintenance and remove predators, usually European Sparrows. Because the house sparrow is a non-native invasive species, it is not protected by the federal game laws. The nest of house sparrows may therefore be removed from any nest box at any time. The front side of the house is hinged near the top and provided with a Phillips screw for easy opening. We do allow tree swallows, chickadees and wrens to nest in the houses as they are all protected species.

Identifying the nests of competitive bird species is important in determining the best location for a bluebird nest box. It is important to move the nest box to a better location if other birds are using it.

- A tree swallow makes a coarse grass nest lined with many feathers.
- The Carolina chickadee produces a small cup nest of moss and plant down, lined with fine hair or animal fur.
- The house wren produces a large deep tunnel made of twigs and spider egg cases leading to a nest of fine bark material.
- A house sparrow produces a large messy nest made up of course grasses, weeds, feathers, and trash.

Pests and predators

Because bluebirds build a new nest for each brood, it is important for anyone maintaining a nest box to remove the existing nest before the adult female begins building a new nest for the next breeding cycle. Removing the old or existing nest prevents the bluebird from building the new nest on top of the old one. This is important because when the new nest is built atop the first nest, the eggs and nestlings will be close to the entrance of the box. This makes them subject to predators, including cats, starlings, raccoons, opossums, and snakes that will destroy a bluebird nest if they gain access.

Several pests can affect the health of nestlings. The female blowfly (Protocalliphora sialia) lays her eggs in cavity nests. When the blowfly eggs hatch, the larvae climb up through the nest material, attach themselves to the growing nestlings, and suck their blood. This occurs during the nighttime hours and may severely weaken the nestlings. A tiny parasitic wasp (Nasonia vitripennis) preys on the blowfly larvae. The eggs of the parasitic wasp exist in the nesting material in the bluebird boxes where blowflies are present. Therefore, when the old nest is removed from the box, it should be left on the ground, in the vicinity of the box. The eggs of the parasitic wasp will hatch and return to the box to parasitize the blowfly larvae in that immediate season.

Bluebirds and Bluebird Nest Boxes

Bluebird House Research

Blue Bird Research Project: Can different roof materials significantly reduce temperatures inside a blue bird box?

We are monitoring different bluebird houses. We first tried to determine which box is most efficient at heat reduction. We measured the temperature of the interior of boxes with different roof structures over the last three years. These roofs were planted green roof boxes, black shingle, and white shingle. After three years of research we concluded that all materials reduce inside box temps by a statistically significant number of degrees. The amount of roof shading may play an important factor in keeping the houses cool. The next steps are to put four boxes randomly in the meadow to see if Blue Birds prefer the green roof boxes. We will record that data for 3 years and then publish a research paper with our results and conclusions.

Additional Resource

“The Bluebird Monitor’s Guide” by C. Berger, K. Kridler, and J. Griggs; Harper Resource, 2001.

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Meadow Garden Component Resources

Boardwalk Decking

http://timbertech.com/why-timbertech/sustainable-living/

Wrought Iron Gate

Artisans of the Anvil, Andrew Molinaro
http://www.artisansoftheanvil.com/
Stroudsburg, PA

Metal Sculptures throughout Meadow Garden including the Spider Web in the Webb Farmhouse

ART Research Enterprises, Inc.
http://www.thinksculpture.com/
Lancaster, PA

Illustrations

Natalya Zahn: http://www.natalya.com/.

Benches are fabricated by Longwood Gardens' carpenters

Black walnut in the house
Other benches made from fallen trees on property

In the Webb Farmhouse:

Paper Bird Sculptures

Diana Beltran Herrera: www.dianabeltranherrera.com.
The works are completely made of paper and feature local bird species

Photography by Longwood Gardens' volunteers and staff, local photographers

Carlos Ajejandro (large photo in Gallery): carlos@caphoto.com.
Jim Moffett: http://jimmoffettphotography.zenfolio.com/contact.html#

Longwood Gardens Herbarium Collection

http://longwoodgardens.org/gardens/about our plants/research/ herbarium

Reproduction Table and Chairs

The Federalist: http://www.thefederalistonline.com/company.shtml.

Reproduction Hutch

Charles Ginty Associates: www.charlesgintyassociates.com. Unionville, PA 19375

Tools and other Implements

Longwood Gardens' Library and Archives Artifacts are mounted on the walls -

Reproduction Hardware:

Michael M. Coldren Company, Inc.
www.coldrencompany.com.
North East, MD

Resources for More Information

Longwood library is a great resource for all these topics and you can take books out as a volunteer or staff member

History

Chester County Historical Society
225 N. High Street
West Chester, PA 19380-2658
610-692-4800
http://www.chestercohistorical.org

Hagley Museum and Library
200 Hagley Road
Wilmington, Delaware
302-658-2400

http://www.hagley.org

Stewardship

http://www.nwf.org/Wildlife/Wildlife-Conservation/Phenology.aspx

Beck, Travis. *Principles of Ecological Landscape Design*. Island Press, 2013.

Tallamy, Douglas W. *Bringing Nature Home: How You Can Sustain Wildlife with Native Plants*. Timber Press, 2009.

Insects

Monarch Watch http://www.monarchwatch.org/index.html

Bee Basics https://www.pollinator.org/PDFs/BeeBasicsBook.pdf

Dragonflies http://www.xerces.org/dragonfly-migration/pondwatch/

http://www.smithsonianmag.com/science-nature/14-fun-facts-about-dragonflies-96882693/?no-ist

Wildflowers and Native Plants

Lady Bird Johnson Wildflower Center

http://www.wildflower.org/plants/

North Creek Nursery supplier of our native plant plugs

http://www.northcreeknurseries.com/index.cfm/fuseaction/home.home/index.htm

Cornell Cooperative Extension – Meadow Gardening

http://ccesuffolk.org/assets/Horticulture-Leaflets/Meadow-Gardening.pdf

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_002090.pdfBirds

Birds

Cornell Ornithology: http://www.birds.cornell.edu/

For Kids: http://www.biokids.umich.edu/critters/Sialia_sialis/

West Chester Bird Club: http://westchesterbirdclub.org

Pennsylvania Society for Ornithology: http://www.pabirds.org

eBird: http://ebird.org

All About Birds: http://www.allaboutbirds.org

PA Audubon: http://pa.audubon.org

eNature: http://www.enature.com

What Bird: http://www.whatbird.com

Apps for Smart Phones:

iBird Explorer Pro by the Mitch Waite Group

Merlin Bird ID by Cornell Lab of Ornithology

The Sibley eGuide to Birds App

National Geographic Birds

Printed Field Guides:

Peterson's Guide to Native Wildflowers

The Sibley Field Guide to Birds of Eastern North America by David Allen Sibley

National Geographic Field Guide to the Birds of North America by Jon Dunn

A Field Guide to the Birds of Eastern and Central North America by Roger Tory Peterson and Virginia Marie Peterson

Kaufman Field Guide to Birds of North America by Kenn Kaufman

Glossary

Ecosystem a balanced community of interacting living organisms (plants, animals and microbes) and the nonliving components of their environment (air, water and mineral soil)

Habitat the geographical area occupied by an ecosystem.

Habitat Matrix many habitats linked together by geographical proximity - each interrelates with another. Change in one habitat may affect all the others. The sum is greater than each individual part.

Meadow is a field habitat vegetated by primarily grass and other non-woody plants.

Non-woody soft tissue plants

Phenology The study of how the biological world times natural events like flowering times

Plant community is a group of plants which all favor similar growing conditions, and structurally relate to each other(short, tall, spreading, etc.).

Riparian buffer A riparian buffer is a vegetated area near a stream, usually forested, which helps shade and partially protect a stream from the impact of adjacent land uses

Stewardship

Successional edge

Upland ridge

Wetland

Watershed the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater. Some are millions of square miles; others are just a few acres. Just as creeks and streams drain into rivers, watersheds are nearly always part of a larger watershed.

Wildlife corridor A habitat corridor, wildlife corridor or green corridor is an area of habitat connecting wildlife populations separated by human activities or structures.

Woody perennial plants with woody stems