THE MOTH PROJECT

DesChene + Schmuki

PLANTBOT GENETICS

GEORGIA SOUTHERN UNIVERSITY

Center for SUSTAINABILITY

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The Pollinators Of East Georgia

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Jeff Schmuki

PLANTBOT GENETICS

2015
False Underwing
Allotria elonympha

THE MOTH PROJECT

All Photography Courtesy Alan Harvey
Wendy DesChene and Jeff Schmuki
Design Wendy DesChene except
Moth Project Logo this page / cover: **Stephanie Neal**

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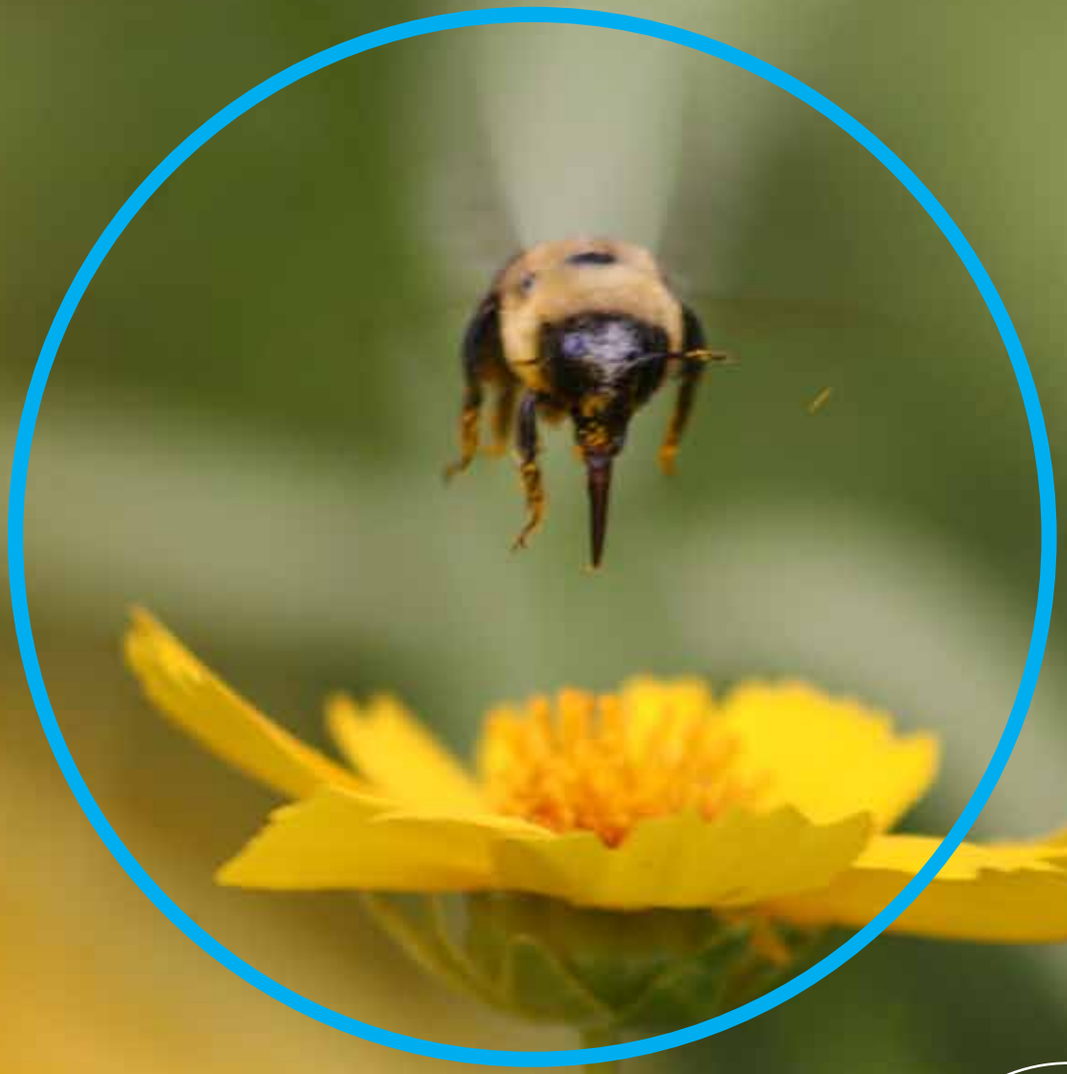


Why Are Pollinators Important?

Working as the art collaborative team of PlantBot Genetics, Wendy DesChene and Jeff Schmuki underscore bee decline and the importance of pollinators in our environment through the Moth Project. This publication provides information on pollinators and offers simple actions that support their numbers while encouraging backyard naturalism and citizen science.

In addition to gathering nectar to produce honey, bees perform other vital functions such as the pollination of agricultural crops, home gardens, orchards and wildlife habitats. Bees transfer pollen from plant to plant, blossom to blossom in search of nectar, thus fertilizing the plants and enabling them to bear fruit. It is estimated that about one-third of the human diet is derived from insect-pollinated plants and the honeybee is responsible for 80% of this pollination.

When you think of crops especially important to Georgia like the watermelon and peaches it's no wonder that the honeybee became the State insect in 1975. Fifty other crops in the state also rely on the bee, proving their important contribution to our economy.

Some Global Crops Dependent on Honeybee Pollination

Coffee, Almonds, Apples, Avocados, Cotton, Blueberries, Cranberries, Cherries, Kiwi Fruit, Macadamia Nuts, Asparagus, Broccoli, Carrots, Peaches, Pears, Nectarines, Plums, Soybeans, Cauliflower, Celery, Cucumbers, Onions, Legume Seeds (Beans, Peas, Lentils), Pumpkins, Squash, Sunflowers, Apricots, Strawberries, Canola, Alfalfa. Cantaloupe, Watermelon, Honeydew.

Second-Shift Pollinators

Although bees and butterflies are our most well known pollinating insects, a wide variety of other insects such as moths, flies, beetles, and thrips also pollinate a wide variety of plants. Could it be possible to rely on these other insects to pollinate our world if the bees disappear? Butterflies may be better known as secondary pollinators to the bees, but moths are more numerous and better at collecting and distributing pollen. Their furry bodies keep them warm at night and also pick up pollen while locating nectar. What would happen if we created solar powered lights over our gardens at night? Could we encourage moths and other “second-shift pollinators” to lend bees a hand and help pollinate our food crops and cotton fields?

There is still so much to learn about moths and science has been slow to discover all of their mysteries. We do know that there are a lot of them, about 165,000 described species in the world.

Since the end of the 19th century, backyard naturalism has been on the decline. Is it a coincidence that the numbers of our important insects have plummeted along with our interest?
Become a citizen-scientist and explore nature with curiosity and your camera. Are bees, butterflies, and second shift pollinators thriving in your garden? What plants do they like and how many can you identify? Get involved, photograph what you find, and share them with your neighbor and an online database so we can all learn more about these vital insects.

MOTH VS BUTTERFLY

Butterflies are actually a group of specialized, day-flying moths in the order Lepidoptera (leh-peh-DOP-ter-ah) but there are other differences that can help you figure out which insect type you may be looking at. Because there are so many species of both there are many exceptions to these rules, but you can use these guidelines to start your exploration on which is which.

Antenna are often feathery or pointed

Rest with wings spread out or at sides

Many have a hairy plump body

Most have subdued coloration

Many are active at night (nocturnal)

Some pupate in a cocoon

Zebra Conchylodes: *Conchylodes ovulalis*

Many have antennae that are thin and end with a knob

Many have a thin smooth body

An example of an exception to many of these guidelines is the large group of Skipper Butterflies.

Many rest with wings together and up

Often brightly colored

Pupate in a chrysalis

Most are active during the day (diurnal)

Monarchs Butterfly: *Danaus plexippus*

FACTS

Pink-Bordered Yellow
Phytometra rhodarialis

Moths can fly up to 3 miles high and use the moon and stars to navigate, but on cloudy nights at least some species rely on the Earth's magnetic field.

Many can fly fast. The Hawk moth flies faster than 20 miles per hour.

Many adults don't have mouths, and only eat as caterpillars! Luna Moths are an example of this.

Only a few of the many thousands types of moths will eat your clothes.

A male moth can smell a female moth 7-8 miles away.

The Atlas moth's wingspan is about 1 foot, bigger than some songbirds. The largest moth in North America is the Cecropia Moth.

Moths are an important part of the food chain for many animals like bats and birds. Because of this some moths discourage insect-eaters by looking and acting like dangerous or inedible animals like wasps, spiders, or even birds.

Moths cannot bite or sting. Some taste terrible, though, and advertise it with bold colors.

Many moths are well camouflaged as tree bark, twigs, dead leaves, or even bird droppings!

Moth and butterfly caterpillars are a common food item for people in African countries.

Moth caterpillars spin a silk cocoon; some like many of the Sphinx moths, pupate under ground.

In extremely cold or dry climates, some moths can live for serveral years. A Siberian moth; the Arctic Woolly Bear can live for 7 years!

Moth wings are covered with thousands of tiny scales and hairs, not powder.

Alan Harvey Thoughts From a Biologist

Anyone in my family will tell you that I was born a biologist, with what they probably considered an unnatural passion for all forms of nature -- birds, bugs, frogs, flowers, you name it, I watched it, collected it, studied it. Until recently, though, moths weren't really on my radar. Yes, there is a picture of a beaming 13-year-old me with a gigantic Cecropia moth clinging to my shirt. And as an undergraduate, I did become obsessed with the swirling dancing clouds formed by tiny black moths with ridiculously long white antennae that appeared each spring at the Jasper Ridge Biological Preserve. But overall, moths just seemed, well, a little boring. As adults and as caterpillars, it is true that they do camouflage very well. But otherwise, their repertoire seemed rather limited. Caterpillars eat. Adults flutter, mate, lay eggs, and die. Food for more interesting animals.

And then, early one morning a couple of summers ago at my in-laws cottage in Maine, my ten-year-old daughter and I stepped outside to head to the lake, when something caught her eye on one of the walls of the open front porch. It was a medium-sized moth, clad in bright, almost garish, yellow and pink fur. We were entranced, and then a bit mystified when we looked around and realized that there were dozens of moths clinging to the vinyl siding (I did not see the small but powerful light-sensitive security lights mounted strategically on the second story until later). Removed from their naturally camouflaging environment, the quiescent moths revealed to us an astounding variety of sizes, shapes, colors, and patterns. Sarah wanted to know the names of each and every one, of course, and I did not know the name of a single one.

And so began a brand new summer routine. Early each morning, we would get up and look for moths. I would take photographs of any moth with which we were not familiar. Then we would spend some time at the computer, trying to match our photographs with images from the Moth Photographers Group website. With no prior background in moth taxonomy, this was excruciatingly difficult and time-consuming at first, and I was not at all sure Sarah would be able to stick with it (frankly, I wasn't sure how long I would last!). But youth's sharp eyes and boundless enthusiasm prevailed over youth's short attention span, and soon she was IDing moths like a pro. We identified over 100 species of moths on those walls, which in our naïveté seemed like a huge number.

I have since met people who have found twenty times as many species from their own yards, but no matter. Moths and moth photography continue to be a passion of mine. Although Sarah's interests have changed as she enters her teenage years, our shared discovery of the thrills and challenges of mothing added a strong and unique dimension to our father-daughter bond. And she can still tell you, with pride and without hesitation, the name of the first moth species she identified completely on her own (*Synchlora aerata*) and the name of that first moth that launched our shared journey (*Dryocampa rubicunda).*

BLACK LIGHT
Insects see light differently than we do. The spectrum of colors in the ultraviolet spectrum is higher in frequency than what humans can see. Insects like moths see ultraviolet light especially well. Set a common black light in your backyard to lure nighttime insects to where you want them to land. It's also helpful to set out a regular light for 'human' eyes. A regular shop light works great and you can hang it near the black light.

MOTH SHEET
Many people use a common bed sheet that reflects the blacklight and serves as a backdrop to see and photograph what insects land. The light and sheet can be suspended between two trees with ropes, or even hung off a clothesline. Just make sure the ropes are tight enough to hold the sheet. More ambitious moth groups use commercial bug tents that are portable and worth the investment if you decide to dedicate many more nights to "mothing."

BAIT
There are many recipes for mixing harmless baits to attract moths in your area. Most include a can of flat beer, a couple tablespoons of molasses, sugar, and a banana. Simply blend, and leave to ferment covered for a week or two before use. It is smelly but has no expiration date. Smear it on your local tree trunk and watch the critters come! A rotten watermelon smashed on the side of a tree will also attract insects.

DOCUMENT
Capture your insects without hurting them by using a camera! A small digital camera with a flash and a macro function will do the trick. Many cameras have this ability but you probably don't use it very often. If you have a larger camera with lenses, a flash will be necessary. Assist others in photographing insects and share your photos with an online database for effective Citizen Science for example, The Butterflies and Moths of North America project: http://www.butterfliesandmoths.org.
Other sites are listed at the back of this book.

HOW TO MOTH

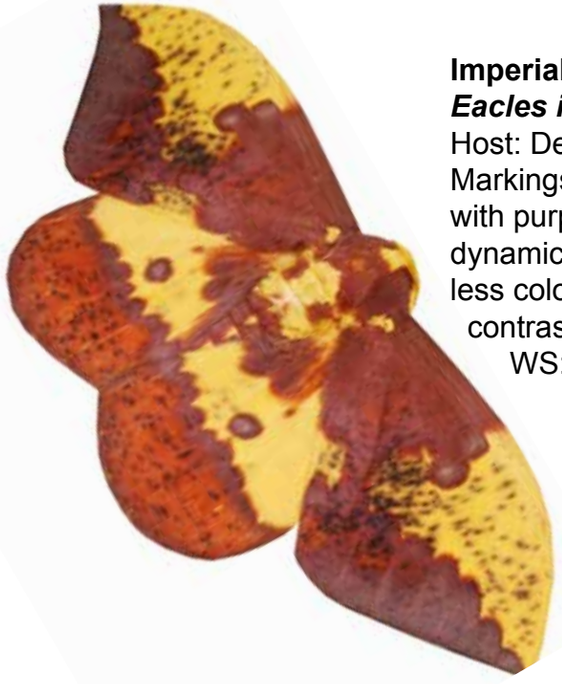
Eight-spotted Forester
Alypia octomaculata

What Moth is it?

In the United States, there are over 12,000 species of moths. Use these pages to identify moths that are in your area! If your insect is not listed, there are more extensive books/websites you can use for identification. As a Citizen Scientist, you can submit your photographs to online databases listed on the resource page for help in identifying what you have found and learning what might still come your way.

WS = WingSpan
TL = Total Body Length

Orange Panopoda
Panopoda repanda
Caterpillar Host: Oak
Markings: Light orange color with faint thin line and spot on each front wing.
WS: 38 mm



Imperial Moth
Eacles imperialis
Host: Deciduous Trees
Markings: Mustard yellow wings with purplish brown speckles and dynamic larger patches. Females less colorful and have less contrasting patterns than males.
WS: 80 - 174 mm

Velvetbean Caterpillar Moth
Anticarsia gemmatalis
Host: Legumes
Markings: Brownish tan wings with thin orange reddish line across the middle.
WS: 33 - 40 mm

Paler Diacme Moth
Diacme elealis
Host: Unknown
Markings: Yellowish wings with irregular thin purplish brown bands. All wings have a dark brown border near the bottom edges. Also looks like the Darker Diacme Moth. *Diacme adipaloides*
WS: 20 mm

Stinging Rose Caterpillar Moth Parasa indetermina
Caterpillar Hosts: Apple, Dogwood, Hickory, Maple, Oaks, Poplars, Rose Bushes.
Markings: Distinct green and brown rounded bands.
TL: 12 - 15 mm

Esther Moth
Hypagyrtis esther
Caterpillar Hosts: Pine Trees
Markings: Reddish orange band on bottom edge of scalloped wings. Purplish gray wing color with thin darker bands. Looks very similar to One-spotted Variant, *Hypagyrtis unipunctata.*

Banded Tussock Moth
Halysidota tessellaris
Host: Deciduous Trees
Markings: Pale tan with irregular thin bands. Thorax has turquoise and a pair of yellow stripes. Also looks like Sycamore Tussock Moth *Halysidota harrisii.*
WS: 22 - 25 mm

Pink Bordered Yellow
Phytometra rhodarialis
Host: Unknown
Markings: Yellow wings with bright pink bands near bottom. Two small pink spots near top of front wings.
TL: 10 - 11 mm

Maple Callus Borer Moth
Synanthedon acerni
Host: Maple
Markings: Wings and antennae may have blue/ purple tones. End of abdomen has bright reddish-orange tuft of hairs.
WS: 18 - 27 mm

Southern Flannel Moth
Megalopyge opercularis
Host: Deciduous Forests; Oak, Elm, Citrus Trees
Markings: Furry orange and yellow hairs around neck. Dynamic brownish and white lower wings. Females are more muted in color.
WS: 24 - 36 mm

Widow Underwing
Catocala vidua
Host: Hickory and Walnut
Markings: Forewing gray with curved thick blackish outer line and blackish Y-shaped inner mark. Hindwings black with white fringe.
WS: 37 - 44 mm

Rose Hooktip/*Oreta rosea*
Host: Birch and Viburnum
Markings: Variable in color but many are rusty brown with a broad yellow band. All wings have a distinct curvy appearance.
WS: 28- 34 mm

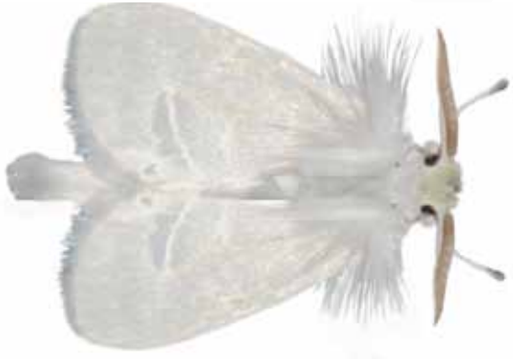
Scarlet Winged Lichen Moth
Hypoprepia miniata
Host: Tree Lichen
Markings: Head, thorax, and wings scarlet; wings with broad dark gray stripes and fringe.
TL: 15 - 21 mm

Blinded Sphinx Moth
Paonias excaecata
Host: Deciduous Trees
Markings: Forewings with scalloped margin; hindwings with blue eye-spot. The abdomen “tail” curves upwards when at rest.
TL: 35 - 50 mm

Laudable Arches
Lacinipolia laudabilis
Host: Dandelion
Markings: Pale green wing color with white wavy lines bordered in black running across the wings. Orange patches on sides of each front wing.
TL: 16 mm

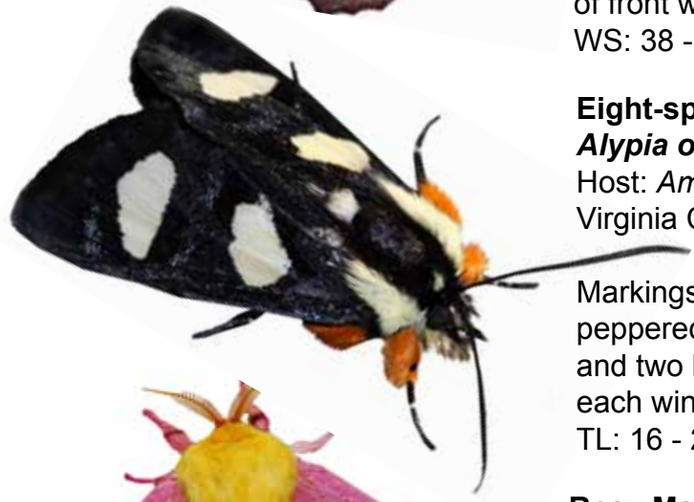
Assembly Moth
Samea ecclesialis
Markings: Outer wings grayish-brown with three groups of several white spots. Male has larger spots than female.
TL: 15-20 mm (males smaller than females)

Brown Panopoda
Panopoda carneicosta
Host: Basswood, Hickory, Oak, and Willow
Markings: Gray brown wings with thin wavy yellow-edged lines running across. Forewing with small black dot and black L-shaped mark.
TL: 21 - 25 mm



White Flannel Moth
Norape ovina
Host: Variety including black Locust, Hackberry and Redbud
Markings: Separated from other all white moths by stout hairy body and fuzzy haired collar. Males have orange antennae.
WS: 27-33 mm

Curve-toothed Geometer
Eutrapela clemataria
Host: Deciduous Trees
Markings: Color is variable light brown to darker purplish brown. Scalloped wings with thin yellow purplish line that forms a sharp point near tip of front wing.
WS: 38 - 56 mm



Eight-spotted Forester
Alypia octomaculata
Host: *Ampelopsis,* Grape, Virginia Creeper

Markings: Velvet black wings peppered with blue scales and two large white spots on each wing. Orange leg tufts.
TL: 16 - 20 mm

Rosy Maple Moth
Dryocampa rubicunda
Host: Maple and Oak Trees
Markings: Hairy bright yellow body with bright pink wings that have a thick yellow band.
WS: 26 mm

Luna Moth
Actias luna
Caterpillar Host: Birch, Alder Sweetgum, Walnut, Sumac
Markings: Large apple green wings marked with sleepy eye spots on upper wings. Feathery antenna. Back wings have long tails twisted near the tip.
WS: 75 - 105 mm

Samea baccatalis
Markings: Light yellowish orange brown moth. Front wings with three rows of square brown-edged white spots and one curved row of smaller, rounder spots towards the tip.
WS: 22 - 24 mm

Tufted Bird Dropping Moth
Cerma cerintha
Host: Fruit-bearing Trees
Markings: Mosaic pattern of earthy colors. Front wings with greenish blue scallops across wings on broad, irregular white band.
TL: 15 - 17 mm

Hebrew Moth
Polygrammate habraeicum
Host: Blackgum
Markings: White with a complex series of fragmented black wavy lines. Black and white checkered pattern on fringe on bottom of wings.
TL: 13 - 15 mm

Tulip-tree Beauty
Epimecis hortaria
Host: Deciduous Trees
Markings: Scalloped multicolored lines all over wings. Hind wings with scalloped edges.
WS: 43 - 57 mm

Umber Moth
Hypomecis umbrosaria
Host: Not Clear
Markings: Males have feathery antenna. Grayish black; each wing has black-edged blue dot and several jagged lines that are white-edged towards the outer margin.
WS: 20 - 25 mm

Polyphemus Moth
Antheraea polyphemus
Host: Trees and Shrubs
Markings: Large cinnamon wings with pink accents.
WS: 100 - 150 mm

Red-Bordered Emerald
Nemoria lixaria
Host: Deciduous Trees and Woody Plants
Markings: Pale green wings and body. Edge of wings bordered with checkered red line. One tiny black spot on each wing. Red-edged white spots on abdomen.
WS: 20 - 30 mm

Dot-lined Moth
Artace cribrarius
Host: Oak, Cherry, Rose
Markings: Pearly light gray with rows of black spots. Woolly white body, legs and abdomen.
TL: 19 - 30 mm

White-dotted Prominent
Nadata gibbosa
Host: Oak, Birch, Cherry, Maple
Markings: Yellowish orange peppered with brown scales. Two thin darker lines and two small whites dots on each outer wing.
TL: 20 - 30 mm

Zebra Conchylodes
Conchylodes ovulalis
Host: Deciduous Trees
Markings: Wings white with violet sheen; six blackish lines.
WS: 23 - 30 mm

Pine Devil Moth
Citheronia sepulcralis
Host: Pine
Markings: Dark violet grey with reddish veins running through wings. Base of back wings rosy.
WS: 70 - 135 mm

Deep Yellow Euchlaena
Euchlaena amoenaria
Host: Unknown
Markings: Peppery yellowish wings shaded rust brown towards outer edges. Light spots near front wing tips.
WS: 30 - 49 mm

Friendly Probole
Probole amicaria
Host: Sourwood and probably other host plants
Markings: Light tan moth with darker band on edge of all wings.
WS: 23- 34 mm

Spiny Oakworm Moth
Anisota stigma
Host: Primarily Oak
Markings: Light orange with peppery spots. White spot on each outer wing. Furry body.
TL: 22- 38 mm (males are smaller)

Beautiful Wood Nymph
Eudryas grata
Host: Peppervine, Grape, Virginia Creeper
Markings: White wings with dark red fringe with a thin yellow-green strip between white and red areas. Tufted front legs extend up and away from its body.
TL: 24 mm

Black Bordered Lemon
Marimatha nigrofimbriata
Host: Crabgrass and Morning Glory
Markings: Lemon yellow wings with purplish dark grey fringe on edge. Two tiny black spots on each of the outer wings.
TL: 10 - 12 mm

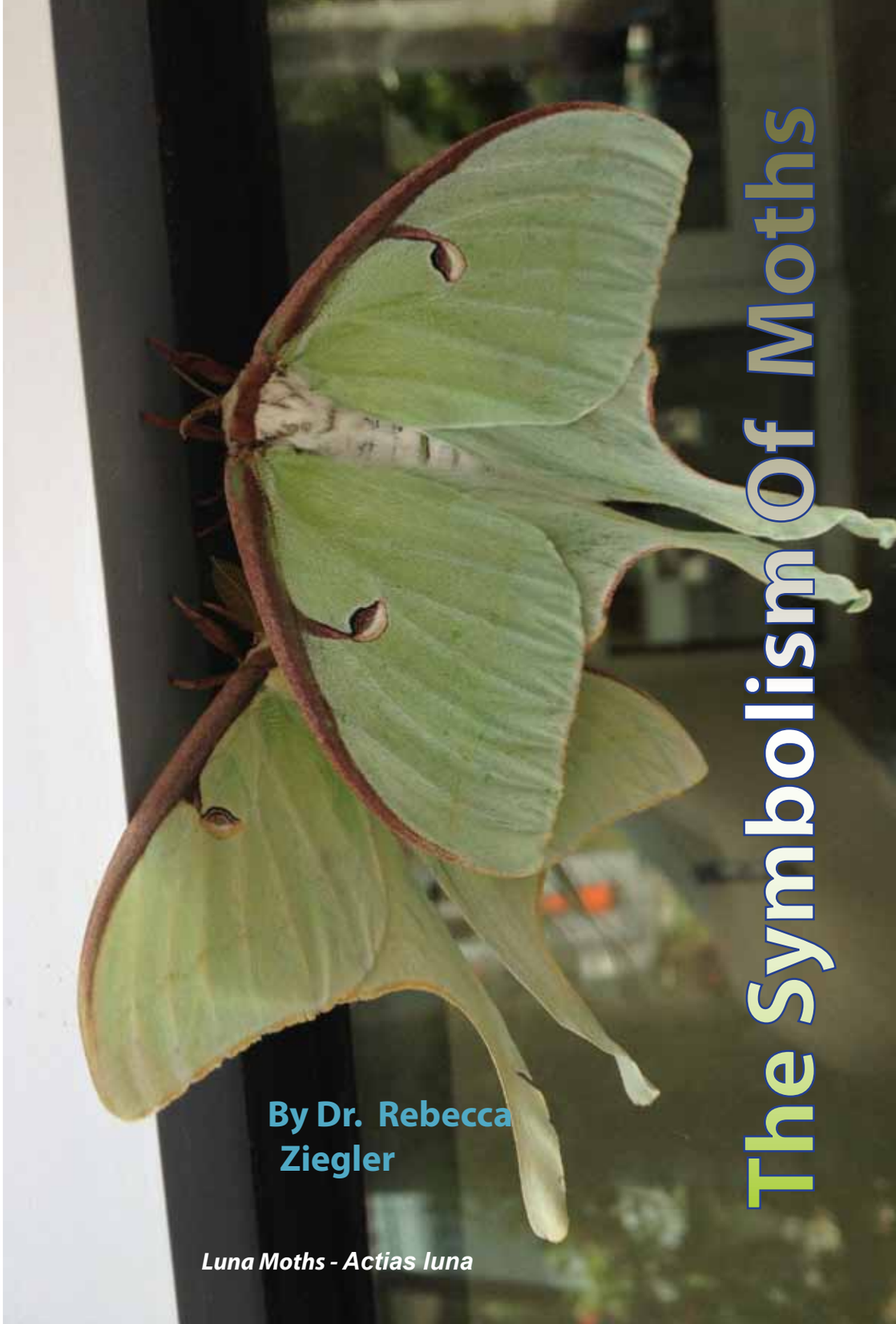
Certain types of symbolism arise naturally out of what we know or observe about moths. They are perceived as sinister and destructive because they come out at night and because they eat woolen cloth. As Jesus said, “Do not store up for yourselves treasures on earth where moths and rust consume” (Matthew 6:19 RSV). Baroque still life paintings, which were often intended to convey the message of vanitas, the fleeting and futile nature of human pleasures, sometimes include moths – for instance, in a painting of sweetmeats, nuts and fruit, wine, and a moth by Osias Beert the Elder (c. 1580-1624); or of a tiger moth and a chestnut (1685), by Adriaen Coorte. Moths in still life paintings are interchangeable with other destructive animals, such as mice, flies, or snakes. In modern tattoo art, the moth is frequently juxtaposed with a human skull as a memento mori, or reminder of mortality.

Most moths are very beautiful, in spite of their sinister associations. A contemporary artist who represents moths for their beauty is Joseph Scheer, who scans them and exhibits the giant blown-up images. Moths are especially plentiful in decorative arts in the Art Nouveau style. For instance, Emile Gallé (1846-1904) depicts moths on glass vases and in wood inlay on a bed – referring to moths as creatures of the night. René Lalique (1860-1945) represents moths in his art glass and jewelry, often intertwined with the bodies of women. This motif probably comes from Art Nouveau’s roots in the Symbolist Movement, which was fascinated by juxtapositions of beauty and destruction and by the femme fatale, the attractive but dangerous woman.

Moths can seem self-destructive because they are attracted to flames or bright lights, even though these may kill them: “like a moth to the flame” is a proverbial phrase for our attraction to anything that could destroy us. On the other hand, the flame can stand for anything vastly greater than ourselves, in which we might wish to be subsumed: Islamic Sufi mystics, according to the poetry of Rumi, are attracted to God like moths to the flame. When the artist Georges de la Tour shows Mary Magdalene staring fixedly at a flame (c. 1640), part of the meaning may be that she is like a moth, drawn to God. A composer, Paul Walde, gets moths to play percussion instruments in his work Composition for Light, Percussion and Ultrasound, by luring them with light to skid across drumheads.

Like butterflies, moths start out as caterpillars. Then they make cocoons, from which they emerge in a radically different shape. And so they can represent any type of transformation, or in Christian terms, resurrection. My impression is that usually we use butterflies rather than moths for this symbolism, however, because they have fewer ill connotations. An instance in which a moth literally becomes an artistic product is the silkworm whose cocoon is made into silk cloth.

Moths are one of the many types of creatures that pollinate flowers. But once again, we generally represent the attraction and transfer of life that pollination implies by means of other pollinators such as bees or hummingbirds that have fewer negative associations for us. The Moth Project may be breaking new ground artistically in focusing on the role of moths as pollinators.
- Dr. Rebecca Ziegler, Georgia Southern University



The Symbolism Of Moths

By Dr. Rebecca Ziegler

Luna Moths - Actias luna

CCD

COLONY COLLAPSE DISORDER

Bees are dying. Colony Collapse Disorder (CCD) is the term for this large-scale decline and death of honeybee colonies worldwide. 80% of all plants on earth depend on pollination by bees for reproduction, which makes CCD a cause for concern. This phenomenon (i.e., the sudden disappearance of worker bees from a colony, leading to colony failure) has been around for a long time, and been given many different names. “CCD” was not recognized to be the same thing at first because it was simultaneously worse in intensity (i.e., much higher levels of disease) and scope (i.e., much of N.A. and Europe) than earlier outbreaks. CCD was first reported in 2005 when commercial beekeepers began noticing adult worker honeybees disappeared leading to the rapid death of the colony.

The main causes of CCD include the intensification of agriculture (including the use of pesticides and decline of weeds), the deterioration of natural areas, the growth of the global human population and the introduction of non-native parasites, such as the varroa mite. The annual losses from the winter of 2006-2011 averaged about 33 percent each year.

Some scientists theorize that some chemicals are responsible for the mass die-offs. Most recent research shows CCD is related to pesticides containing neonicotinoids. Neonicotinoids are absorbed into plant tissues and are present in pollen and nectar, making them toxic to honeybees and other important pollinators. Neonicotinoid pesticides can persist in the soil and be absorbed by plants for up to six years with just one application. Commercial growers use seeds coated in insecticides and many plants available at home and garden stores contain neonicotinoid pesticides that are deadly to bees and other pollinating insects. Dozens of different pesticides and fungicides have been found in pollen collected by bees foraging in crop fields, some at dangerously high concentrations. If the use of neonicotinoids and other dangerous pesticides continues and bees decline, our food production will be severely limited.

There is strong evidence that supports the detrimental effects of toxins in our environment. Pesticides in particular have been found in water supplies resulting from agricultural runoff from fields that collect in nearby bodies of water. These toxins not only impact vital insect populations but harm birds, earthworms, and aquatic animals and plants.

WHAT IS CAUSING CCD?

Habitat Loss
Although beautiful, lawns do not feed beneficial insects. Due to urban sprawl and land development there are fewer flowering plants offering nectar and pollen for bees. This lack of food and habitat makes bees scarce and more susceptible to mites, viruses, fungi, and other pathogens. Without bee pollination, many of the world's fruits and vegetables would not exist.

Pesticides/Fertilizers
Pesticides and fertilizers cause bees great harm, sometimes damaging entire colonies. Neonicotinoids are a "systemic" form of pesticide. What makes them super effective at keeping pests at bay is that they suffuse and "express" themselves in the whole plant when it germinates, including nectar and pollen. The problem is that this kills "nontarget" beneficial insects as well. Interesting fact: at least for almond trees, bees improve crop yield far more than fertilizer or even irrigation!

Overworked Bees
Long-distance transportation of bees to perform pollination services is common in in the USA , but significant stress is caused to bees when transported long distances. Trucking and even flying whole colonies across the nation to pollinate crops with a small area allows contact with other bees from other parts of the country and spreads viruses and mites among colonies that often lead to Colony Collapse Disorder.

Corporate Farms/ Industrialization
Monoculture is the agricultural practice of producing or growing one single crop over a wide area. Honeybees are the most widely used pollinator of such industrial food crop production. Unfortunately, having only one type of pollen for food leads to certain nutrient deficiencies. Bees fed pollen from a range of plants have a healthier immune system and are better able to protect themselves and their larvae from microbes and pathogens. Additionally, the increased uses of broad-spectrum insecticides kill all kinds of insects, including the beneficial bees.

One of the easiest ways to help is to plant food for our pollinators. Cultivate a pollinator garden.

Limit grass that does not provide food for pollinators.

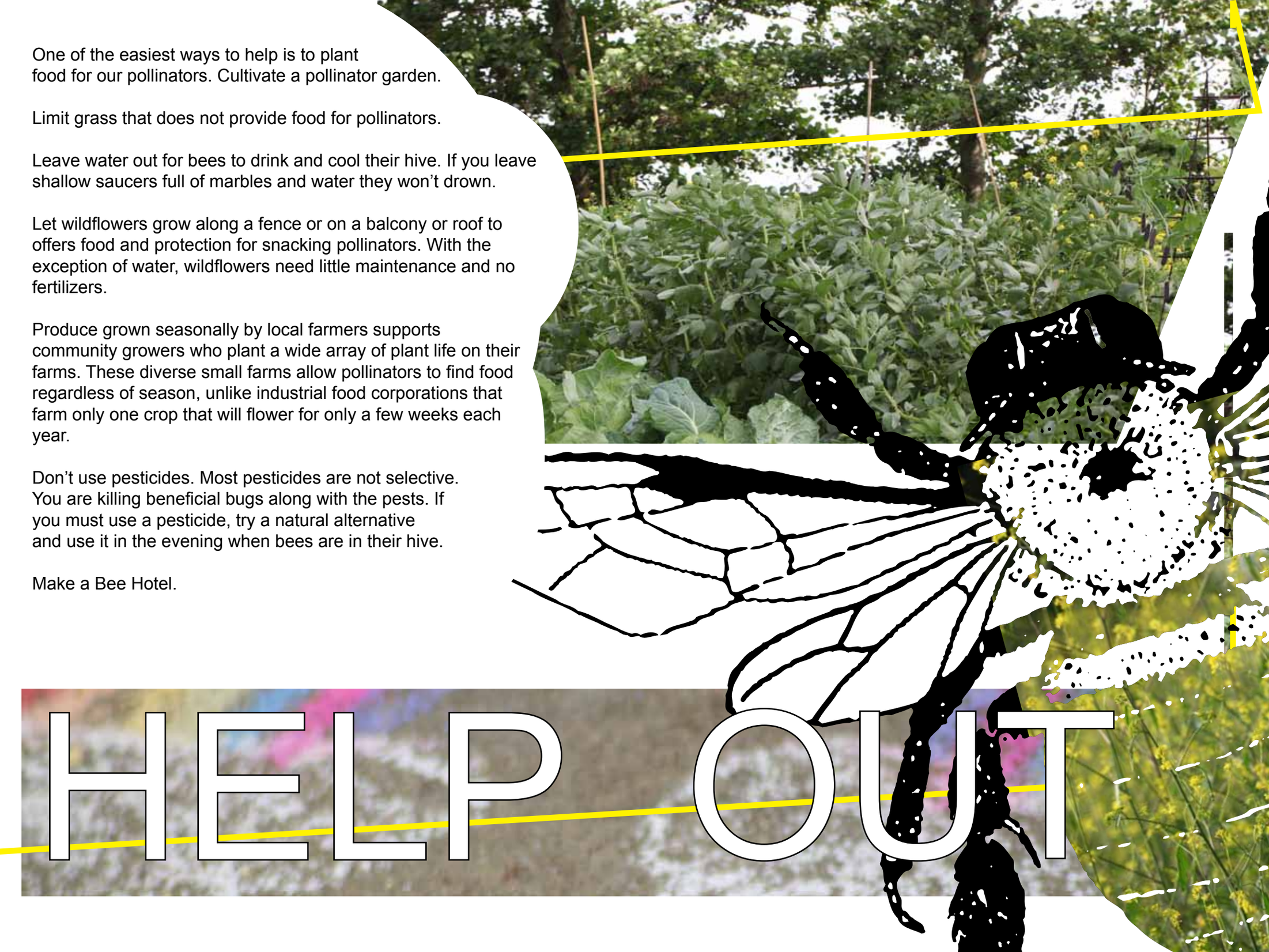
Leave water out for bees to drink and cool their hive. If you leave shallow saucers full of marbles and water they won't drown.

Let wildflowers grow along a fence or on a balcony or roof to offers food and protection for snacking pollinators. With the exception of water, wildflowers need little maintenance and no fertilizers.

Produce grown seasonally by local farmers supports community growers who plant a wide array of plant life on their farms. These diverse small farms allow pollinators to find food regardless of season, unlike industrial food corporations that farm only one crop that will flower for only a few weeks each year.

Don't use pesticides. Most pesticides are not selective. You are killing beneficial bugs along with the pests. If you must use a pesticide, try a natural alternative and use it in the evening when bees are in their hive.

Make a Bee Hotel.



Plant A Beneficial Pollinator Garden

Plant local native plants, heirloom varieties of herbs, and perennials when possible. These plants are easy to grow and four times more attractive to native bees than other plants. Native plants also echo the natural eco-system, allowing foraging for a wide range of species and increasing the biodiversity in the area they are planted. Once established, native plants don't need fertilizers, herbicides, or watering. In addition, they have developed their own defenses against many pests and diseases, allowing the gardener to reduce chemical dependency, labor and costs.

Native and heritage plants also offer the most complete sources of nourishment for pollinators. Local wildflowers have evolved to have a symbiotic relationship with the area's pollinating insect partners. Although no one knows for certain, many believe the shapes of petals found in native plants have adapted to form the perfect drinking cup for local nectar drinking pollinators while exotic plants often have petal shapes that do not allow easy access for these insects. Native plants can also serve as host plants to eggs and larvae of some pollinator species.

Also, beware of plants from retail nurseries. In 2014, testing showed that 51% of plants bought from stores in 18 cities across the U.S., including Home Depot, Lowe's, Walmart, and Orchard Supply Hardware had levels of a group of harmful pesticides known as neonicotinoids that were high enough to kill honey bees, bumble bees, and other pollinators.

TOP PLANTS FOR BEES
Native Coastal Georgia Plants Include:

Beebalm
Monarda

Blanketflower
Gaillardia

Aster
Symphyotrichum

Purple coneflower
Echinacea

Goldenrod
Solidago

Sunflower
Helianthus

Tuliptree
Liriodendron

Holly - *Ilex*

Titi - *Cyrilla*

Cherry Laurel and wild plum
Prunus

Butterfly Weed
Asclepias tuberosa

Skyflower
Hydrolea corymbosa

Chose several colors of flowers. Bees have a color vision that allows them find colors such as blue, purple, violet, white, and yellow. Interestingly, they can't see red!

Flower clustered into clumps of one species attract more pollinators. Include flowers of different shapes that bloom all season. There are 4000 different species of bees in the United States, each of various sizes and tongue lengths that feed on different shaped flowers throughout the year. Planting diverse flower shapes with different bloom times means more bees can benefit all season long.

Plant where bees will visit. Bees favor sunny spots over shade and need water and shelter from strong winds.

Plant organic seeds or use plants from a trusted source that have not been genetically modified or have not been produced with pesticides that can last for years in the plant and soil. Many beautiful plants sold at the big hardware store or nurseries have pesticides present within the plants! These poisonous plants are not labeled in any way. It is best to grow plants from organic seeds purchase plants from a trusted source.

Plant Native

BEE HOTEL

Pollinators evolved alongside native plants and some only emerge and forage for short periods when their favored plants are in flower. You can further encourage native bees into your area by offer them homes. Most native bees usually don't build hives like honeybees. Bee hotels provide a selection of natural tubes and can be purchased or made at home.

Bundles of short (4"-8") twigs, wood chips, rolled up paper, thin cardboard tubing, blocks of wood with holes drilled into them and hollow reeds (bamboo) can make great bee hotels. Some bees will only use such tubes.

Simply bundle a handful of natural tubes, of different diameters together. Secure them in place with string and place in a covered, sheltered, undisturbed situation. They must stay dry. You can also build an open sided box to house the bundle of tubes and add a simple rain-deflecting roof for your simple bee hotel. Other insects such as Ladybirds may also move into the bee hotel. They are also beneficial for your garden as they eat plant-sucking aphids.

More information on how to make various types of bee hotel can be found here: http://www.inspirationgreen.com/insect-habitats.html

Image Example: Hortus Botanicus Garden in Amsterdam

information

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bumblebeeconservation.org
http://www.ent.uga.edu/bees
http://beeraw.com/savethebees

2. Help With Identification
bugguide.net
www.butterfliesandmoths.org
www.projectnoah.org
mothphotographersgroup.msstate.edu
www.discoverlife.org

3. Creating A Habitat
http://extension.uga.edu
https://georgiaorganics.org

5. Moth Upload Sites / Citizen Science
www.butterfliesandmoths.org
www.projectnoah.org
www.bugguide.net

4. Other Great Web Sites
http://sos-bees.org
www.nature.org
www.livescience.com

5. For Children and Teachers
www.biokids.umich.edu/critters
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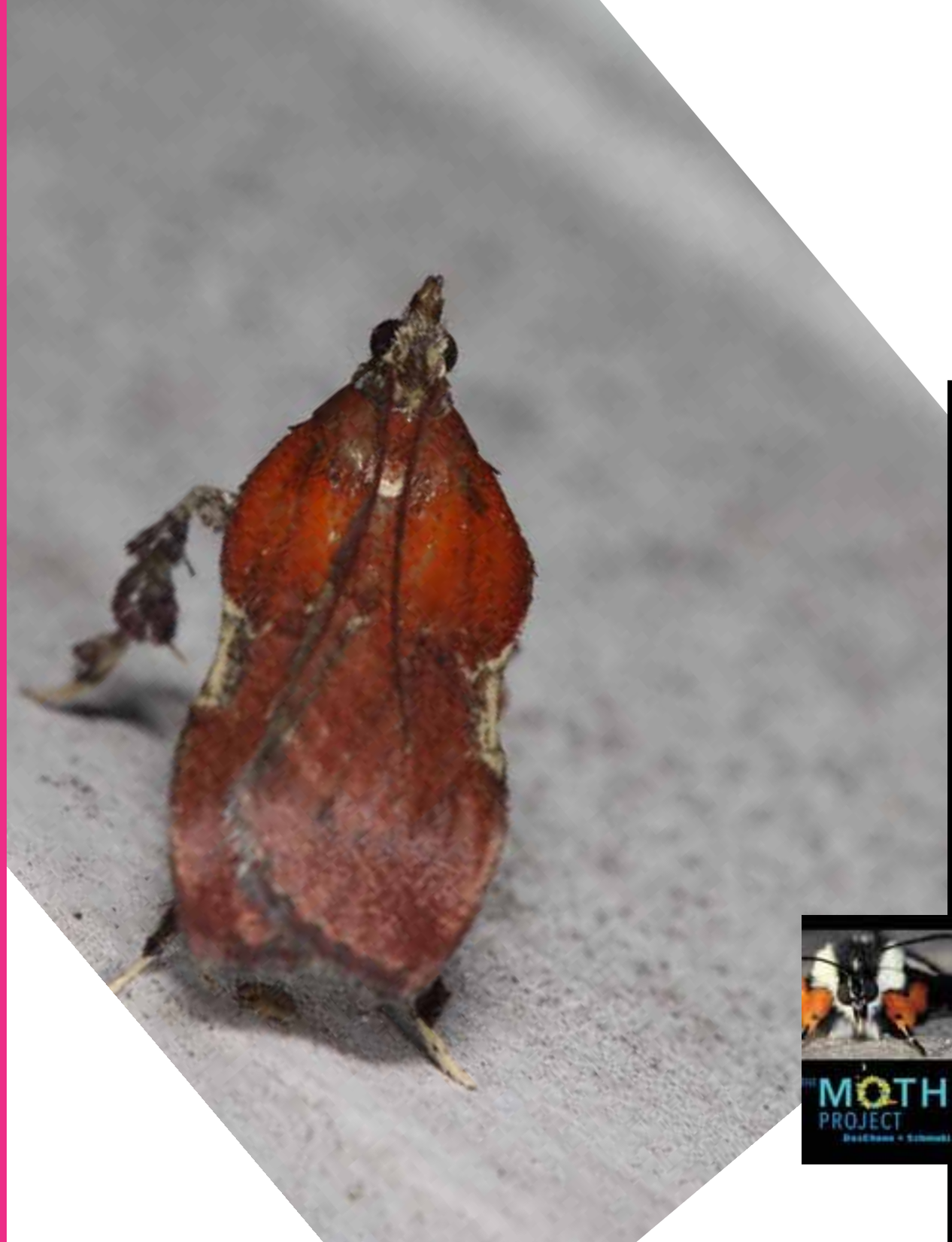

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Student Sustainability Fees at Work!

Center for SUSTAINABILITY

Boxwood Leaftier / *Galasa nigrinodis*