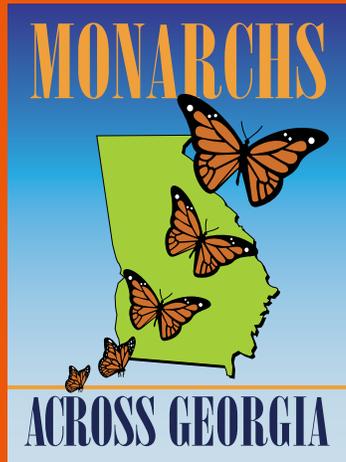


The Chrysalis



Emerging News from Monarchs Across Georgia

A COMMITTEE OF THE ENVIRONMENTAL EDUCATION ALLIANCE OF GEORGIA



2019 Monarch Population Prediction

Adapted from Dr. Chip Taylor's Monarch Population Stats Prediction

Dr. Chip Taylor, the founder and director of [Monarch Watch](#) based at the University of Kansas, is famous for his monarch population predictions. It is well-known that every year he gathers data from many sources such as butterfly tag records, weather, and previous year's population data, to make a prediction for the fall. The forecast of expected migrating and overwintering population depends on what happens during March and April in the Southern region (primarily Texas and Oklahoma), and on what happens in May as the first generation moves northward.

In a [webinar](#) conducted in March 2019, Dr. Taylor introduced a Stage-Specific Model for Monarch Population Development. This model is aimed at understanding the variation in monarch numbers from one year to the next.

Dr. Taylor breaks down the year into six stages to better understand the monarch annual cycle:

1. Overwintering: late October – early April
2. Return migration through Mexico: late February – April
3. Breeding in the US: March and April
4. Re-colonization of the regions north of latitude 37 degrees North: May – early June
5. Summer breeding north of 37 degrees N: June – August
6. Fall migration: August – October

While there is some overlap, each stage is intended to gather and document the dominant activity during that period. This model uses data that are based on the conditions associated with the growth of the monarch numbers each year from 1996 to the present. Dr. Taylor's [blog](#) posted on May 2, 2019 provides the details of the data needed for the model, which include patterns associated with first sightings, and the temperatures in March through October.

To begin the forecast, the relative survival and fitness of the overwintering population and return migration would be extremely useful information. However, the measures of mortality during the overwintering stage and in the journey to the milkweed rich areas of Texas are too fragmented to use in the model. The uncertainty of this data is intensified since mortality during the journey from Mexico to Texas is affected by spring droughts, high temperatures and strong winds. Given the

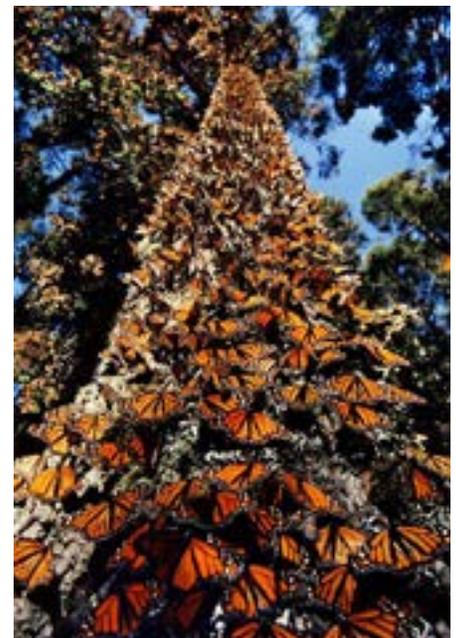


Photo © Frans Lanting

Continued on page 2

Upcoming Events

Plant Sale

Saturday, September 21, 2019
8 am – 12 pm
Roswell Farmers and Artisans Market
at Roswell City Hall
38 Hill Street
Roswell, GA 30075

Symbolic Migration

Deadline to mail Class Ambassador
Butterfly and enclosures:
Friday, October 11, 2019

RayDay

Sunday, October 20, 2019
3 pm – 6 pm
Serenbe
10950 Hutcheson Ferry Rd
Chattahoochee Hills, GA 30268

MAG Pollinator Habitat Grants

Deadline for online applications
Friday, November 15, 2019

MAG Pollinator Habitat Award and Service Awards

Deadline for 2019 nominations:
Friday, February 7, 2020

For more information about these events or to register, please visit www.eealliance.org/mag-events.

2019 Monarch Population Prediction... Continued from cover

lack of mortality data, the data of first sightings in the US becomes an important measure of the overwintering population and return migration. When the temporal and spatial distribution of these sightings is analyzed in the context of the physical conditions and comparisons across years, they yield useful results.

At the end of stage 3 (in early May 2019), Dr. Taylor's expectation for 2019-20 (based on first sightings, temperatures, probable egg distributions, generation length, and conditions in early May), was a good year- with the population likely to occupy 4 hectares. The end of stage 4 is said to be early June based on the end of monarch's directional flight. With the exception of the areas east of Toronto, eastern New York, Pennsylvania, and New England, low temperatures were prevalent in the Northeast in the first half of June 2019. This caused lower colonization of the northeast by first generation monarchs.

With the exception of the Northeast, stage 5 re-colonization was better with respect to timing as well as numbers. When this is combined with the long-term temperature forecasts for the Upper Midwest and the North Central region, Dr. Taylor's prediction is that the 2019-20 overwintering population will occupy at least 5 hectares, and could trend towards 6 hectares if the summer temperatures from 80 degrees W (western Pennsylvania) to the west (105 degrees W) average at least a degree above the long-term averages.

Please follow the [Monarch Watch blog](#) for a summary of the outcome of stage 5 (June-August)

Symbolic Migration 2019

Symbolic Migration for 2019 has begun! Children (and others) from across the country will create and send symbolic monarch butterflies to Mexico for the winter. Children living near the monarch sanctuaries in Mexico will protect the butterflies through the winter, then send them back north in spring.



If you know of a school, senior center, Scout troop, or other organization that might like to participate, please share the [Symbolic Migration webpage](#) that has the how-to information, links to the teacher packet, and how to register.

Postmark deadline for the 2019 Symbolic Migration is October 11.

Last year's migration included symbolic butterflies from 46 states in the U.S., three Canadian provinces, and one classroom from an international school in South Korea.

Finding Georgia's Roadside Milkweeds

Help the Department of Transportation locate milkweed.

The Georgia Department of Transportation (DOT) needs your help in finding patches of milkweed growing along our roadsides. The DOT plans to implement a new mowing program that is designed to support pollinator plants. Knowing where the milkweeds are will help the DOT know where to begin!

HOW YOU CAN HELP

- When you see milkweeds along a roadside, note the location and send it to one or more of the email addresses below.
- Be safe! Ask a passenger to pin the location on his or her phone rather than risk stopping on a roadside. Another option is to drop a pin using Google Earth or a map app. Include as much location-data as you can. Latitude/Longitude is best, but other descriptions, such as the nearest intersection or highway mile-sign, are good, too.
- Email milkweed locations to the Georgia DOT:
 1. Felicity Davis (fdavis@dot.ga.gov)
 2. Adrienne Kasel (akasel@dot.ga.gov)
 3. Meg Hedeem (mhedeem@dot.ga.gov)

Your support for pollinators, expressed in so many ways, is valuable. Thank you!

Tribal Alliance for Pollinators

A conference on Restoring Tribal Lands to Protect Pollinators

By Trecia Neal, MAG Committee

Earlier this spring, I had the honor of being invited to attend the Tribal Alliance for Pollinators (TAP), an annual conference organized with the theme "Restoring Tribal Lands to Protect Pollinators, Preserve Culture and Restore Connections," in Tulsa, Oklahoma. I was very impressed and excited to learn about what TAP is doing to promote monarch habitat and education. There were 17 tribes represented at the conference, with 80 attendees and people from as far away as California in attendance.

Tribal Alliance for Pollinators is a non-profit organization started in 2015 from the outpouring of support that was generated by the Tribal Environmental Action for Monarchs (TEAM). TEAM is a coalition of seven tribal partners — Chickasaw, Seminole, Citizen Potawatomi, Muscogee Creek, Osage, Eastern Shawnee, and Miami Nations. These tribes are working to restore monarch habitat on their lands with the assistance of Monarch Watch and the Euche Butterfly Farm. The TEAM coalition has restored over 50,000 milkweeds and 30,000 native wildflowers on 350 acres of habitat. This is the only tribal coalition in the world working on monarch conservation.

TAP is a resource for tribes throughout North America, providing training and technical support to conserve and restore grassland ecosystems to help threatened pollinators. TAP also supports initiatives to preserve native plants, which also helps in the continued practice of indigenous cultural, medicinal and culinary traditions.

Tribal conservation actions to support monarchs started from a 2015 National Fish and Wildlife Foundation Monarch Butterfly Conservation Fund project with [Monarch Watch](#) and seven Native American tribes in eastern Oklahoma. This project has provided training needed to plant milkweed, and to collect, process, store and propagate seeds of native milkweeds and wildflowers. It has also established seed production plots, created demonstration plots, and developed conservation plans, including site selection and preparation, as well as long term maintenance of restored properties.

Sources:

1. November 28, 2017, and Comments (2) . "Tribal Alliance Will Conserve Monarchs." *Official Web Page of the U S Fish and Wildlife Service*, <https://www.fws.gov/news/blog/index.cfm/2017/11/28/Tribal-Alliance-will-Conserve-Monarchs>.
2. "Tribal Alliance for Pollinators Holds Debut Conference." *Mvskoke Media*, <https://mvskokemediacom/tribal-alliance-for-pollinators-holds-debut-conference/>.
3. Tribal Alliance. "Welcome to Tribal Alliance for Pollinators." *Tribal Alliance for Pollinators*, <https://tapconnection.org/>.

The Euche Butterfly Farm (EBF) in Bixby, Oklahoma, operated by members of the Muscogee (Creek) Nation, has taken on a leadership role in working with tribes in Oklahoma since the 2015 grant. TAP director Jane Breckinridge is a Muscogee (Creek) citizen, who runs the Euche Butterfly Farm as a sustainable agricultural practice of butterfly farming that can also create jobs for tribal members and be a hands-on tool for engaging youth in science. The EBF maintains a seed bank of locally sourced native milkweeds and wildflowers as a resource for tribal habitat restoration.

Given the success of their program and increased interest from other tribal partners, the EBF and Monarch Watch recognized a potential to enable tribes nationwide to engage in monarch conservation activities. Since then, the liaisons between tribes and the U.S. Fish & Wildlife Service, along with regional pollinator and monarch coordinators have hosted two tribal workshops with more than 26 Native American tribes from Oklahoma, New Mexico and Arizona. Funding was provided by the Native American Fish and Wildlife Society.

The workshops were notable for bringing together for the first time various groups of people, for the cause of conserving a butterfly that is culturally significant. Since many of the Southwest tribes originate elsewhere in the US, the monarch butterfly connects them to their ancestral land. The Hopi and Cherokee have a traditional social dance that recognizes the butterfly for its beauty and its contribution in pollinating plant life. This dance is considered one of the most beautiful ceremonial events.

This was a very informative conference where I learned first-hand what the tribal nations are doing to build habitat for monarchs and pollinators, educate their tribal citizens, and also learn a viable way to generate income.

The date for the 2020 conference will be announced soon. In the meantime, please [watch out for webinars](#) from TAP. The first one is out now, on the topic of "[Propagating Native Plants for Restoration Using Western Science and Traditional Knowledge](#)".

Help us track the health of Queen and Soldier butterflies

Project Monarch Health needs your help monitoring the health of two more *Danaus* butterflies.

Project Monarch Health (Monarch Health) is a citizen science project in which volunteers sample wild monarch butterflies to track the spread of the protozoan parasite *Ophryocystis elektroscirrha*, known as OE. By tracking the spread of OE across North America, Monarch Health aims to understand host-parasite interactions to enhance the awareness of monarch biology and conservation. OE is a single-celled protozoan organism that infects monarchs, queen, and lesser wanderer butterflies. It lives within the host, grows and multiplies. However, when it is not inside a host, OE survives in the environment as spores that are resistant to extreme conditions.

Sampling kits are sent to volunteers who take samples from monarch abdomens using stickers that are mailed back to Monarch Health for analysis. Volunteers release the sampled butterflies unharmed. In 2018, volunteers submitted 11,800 samples from 34 states/provinces across North America. The [Monarch Health website](#) provides detailed information on the research efforts, and [instructions on how to collect samples](#) from butterflies.

Monarch Health is expanding its volunteer-led efforts to monitor the presence of OE-like parasites in close relatives of monarchs, namely the Queen (*Danaus gilippus*) and Soldier (*Danaus eresimus*) butterflies. Volunteers can use the existing datasheets and write the butterfly species in the section marked "Notes". Updated datasheets and information on the website will be available soon!

Queen and soldier butterflies occur mainly in the southern U.S., including the states of SC, GA, AL, FL, MS, LA, TX, AZ, NM, OK, UT, NV, and CA. If you think you have queens or soldier butterflies at your sampling locations, please consider sampling them for the protozoan OE along with any monarchs you might find.

Project Monarch Health invites you to visit their [Facebook](#) page and [Instagram](#) account for interesting facts about monarchs and updates to the monitoring project.

Email monarchhealth@gmail.com to request a sampling kit, to ask questions about monarch parasites and project protocols, or to request a Skype tour of our laboratory for your classroom or nature group.

Learn how to identify them on page 5

Call for Committee Volunteers

ARE YOU INTERESTED in volunteering with the Monarchs Across Georgia (MAG) committee?

If so, please email mag@eealliance.org and let us know what volunteer opportunities interest you.

Here are the many ways that we could use your help!

Write newsletter articles

Become a MAG workshop facilitator & co-facilitate workshops

Review grant applications

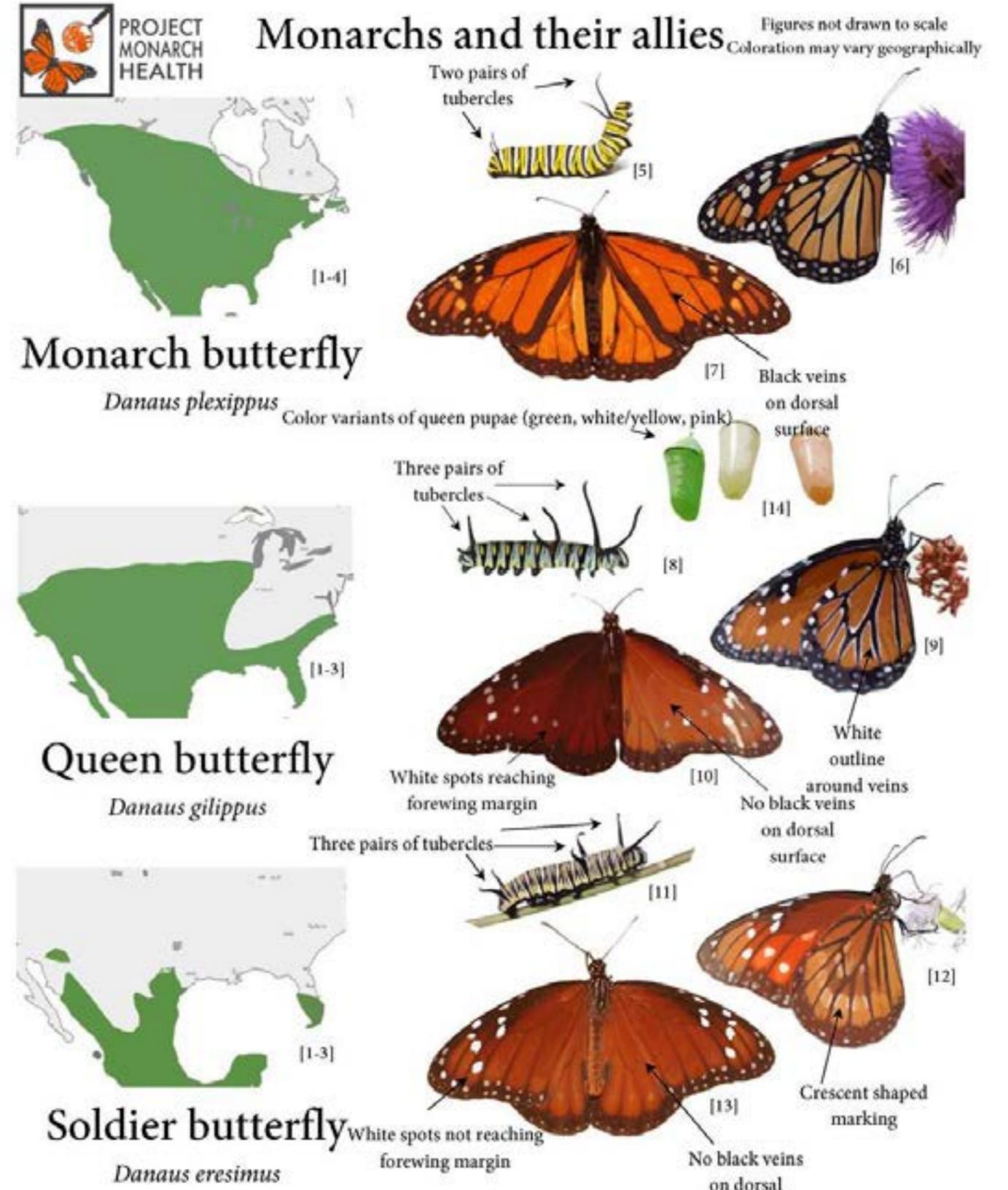
Become part of our Speakers Bureau

Post information on our web pages

Help with an event (children's craft or answering questions)

Become an active committee member and coordinate a project, such as...

- Grant Administration
- Newsletter Editor
- Symbolic Migration
- Mexico Book Project
- Plant Sales
- Pollinator Habitat Certification
- Volunteer Coordination
- E-blast/Email List



REFERENCES: Necessary distribution maps reproduced from Map of Life (<http://www.mapoflife.org/>). Sources: [1] Ma, W., McPherson, L.M., and Goodrich, R.P. (2012). Integrating biodiversity distributions and a global map of life. *Trends in Ecology and Evolution* 27:151-154. DOI:10.1016/j.tree.2011.09.007. [2] Glasberg, I. (2007). *A field guide to the butterflies of Mexico and Central America*. Montrose, New Jersey: Stackpole Books. [3] Scott, J.A. (1986). *The butterflies of North America*. Stanford, California: Stanford University Press. [4] Tolman, T. (2001). *Colletes butterfly guide: The most complete field guide to the butterflies of Britain and Europe*. United Kingdom: HarperCollins. Figures reproduced from: [5] Bill Brown (<http://billbrown.com/>), [6] Bruce Martin (<http://billbrown.com/>), [7] David Ransom (<http://billbrown.com/>), [8] Aronaka Lal (<http://billbrown.com/>), [9] Indrakshi (<http://billbrown.com/>), [10] Christopher Down (<http://billbrown.com/>), [11] Dale Clark (<http://billbrown.com/>), [12] Judy Gallagher (<http://billbrown.com/>), [13] Kozal (<http://billbrown.com/>), [14] MCHM (<http://billbrown.com/>) all links accessed July 2019.

Pollinator Grants for 2019-2020

Monarchs Across Georgia (MAG) is happy to announce that we are now accepting applications for the 2019-2020 grant year. In the past, grant monies were derived from the profits made on MAG plant sales and from the financial support of U.S. Fish & Wildlife Service Southeast Region. We appreciate the technical advice and funds provided through the Partners for Fish and Wildlife program. We are also honored to partner with the Rosalynn Carter Butterfly Trail in habitat restoration and conservation efforts. [See a complete list of our grant recipients since the program began in 2012.](#)

Grant money for the 2019-2020 year comes from profits made on MAG native plant sales. We will be awarding five \$300 grants to the awardees.

Projects must create or enhance an outdoor pollinator habitat that fulfills the specific requirements of the [MAG Pollinator Habitat Certification](#). We recommend certifying with the [Rosalynn Carter Butterfly Trail](#) for educational purposes, but this is not a grant requirement.

The project must include an educational component (signage, brochure, program, outreach, etc.) regarding pollination, and promote MAG Pollinator Habitat Certification Program.

Eligible Projects

MAG Pollinator Habitat grants must be used on a site within the state of Georgia, and can be used to fund the following:



- Plants, seeds, soil amendments, mulch, hardscape (raised beds, trellises, basking or puddling features), and irrigation equipment.
- Instructional materials directly used for and related to the project, i.e., seed-starting/growing system, hand lenses, field guides, children's books, curriculum guides.
- Signage, brochure or materials directly related to the project's educational component.
- Professional development directly related to the utilization of pollinator habitat (limited to \$150.00)
- Registration and certification as a [Monarch Waystation](#) through Monarch Watch.

Pollinator Habitat grants cannot be used for:

- Salaries, payments, or stipends to teachers, grant applicants or contractors
- Travel expenses
- Food or beverages
- T-shirts or other "swag" items
- Memorials or monuments
- Items used solely for beautification
- Insecticides
- Milkweeds not native to Georgia (See Milkweeds of Georgia Field Guide for details.)

Eligible Applicants

To apply, you must...

- [Be a member of the Environmental Education Alliance \(EEA\)](#) throughout the grant period
- Be an employee, volunteer or owner/administrator associated with the school, organization or business.
- Complete the online application form and all additional forms.

Time-frame

The application period for 2019-2020 is currently open. **The deadline for online applications is November 15, 2019.** Selected applicants will be notified by December 31, 2019. Funds will be distributed in January as soon as any questions concerning the application have been answered. All funds would need to be expended according to the proposed plan, with the final report due June 15, 2020. The application for Pollinator Habitat Certification would need to be submitted before the final report deadline.

We look forward to reviewing all eligible applications and notifying the top five applicants. For questions, please email phc@eealliance.org.



'Monarchs in the Rough' is a program jointly promoted by Audubon International and the Environmental Defense Fund to provide unique opportunities for golf courses to participate in the conservation of monarchs. The program partners with golf courses to create habitats in out-of-play areas for monarchs and other pollinators. The goal is to establish one acre of high-quality monarch habitat. To accomplish this, 'Monarchs in the Rough' provides appropriate milkweed seed to golf courses which will be planted with a native pollinator seed mix. Other native plants can be added to the seeded areas to complete the desired habitat.

Milkweed plants provide habitat for monarch eggs to be laid on and food for the caterpillars. Monarch larvae will only eat milkweed. The native nectar-producing plants are for the adult monarchs and other pollinators to use as a food source.

Currently, 'Monarchs in the Rough' has hundreds of golf courses participating across North America. Each participating course helps the monarch on its journey toward the overwintering mountains of Mexico or along the coast of California.

One of the participating courses is The Creek at Hard Labor Creek State Park. The Friends of Hard Labor Creek have begun creating habitat in phases. Phase one is a pollinator garden at the club house. Monarchs have already been active at this site – they are seen flying around sipping nectar, laying eggs, and larvae have been eating milkweed. Phase two will be in place this fall near the 12th hole.

'Monarchs in the Rough' offers signage, posters, and technical guidance to golf course managers to help install and manage habitat, and to communicate with members about the effort. By joining 'Monarchs in the Rough', golf courses can gain recognition as environmental leaders in their communities as they help to promote monarch and pollinator conservation. Please [visit the 'Monarchs in the Rough' website](#) for more information, and recommend it to your favorite golf course!



Tribute to Tom Patrick, revered botanist and plant conservationist



Monarchs Across Georgia joins naturalists across the state in paying tribute to Tom Patrick, well-respected conservation botanist who worked for 33 years with the Wildlife Resources of the Georgia Department of Natural Resources Division. He inspired many with his devotion to preserve Georgia's natural ecosystems. He was a mentor and unfailing resource-person for many in the conservation community, and it is always hard to lose someone like Tom who inspired so many. In a tribute to Tom, Meg Hedeem, State Environmental Liaison with the Georgia Department of Transportation, observed that we can keep Tom's legacy alive with some simple ways to make his work live on, such as:

1. Go outside and appreciate our natural world. There are walks led by the Georgia Botanical Society and other organizations all around the state in some of our most beautiful parks and other natural areas.
2. Find some space in your yard for native plants. The plants will attract beautiful butterflies and other pollinators.
3. Check out the programs offered by the Georgia Native Plant Society; maybe attend a meeting or a talk. The Society can help you find nurseries that sell native plants
4. Share your knowledge of native plants with others!
5. In your conservation efforts, be open to discussion and negotiation, and take the time to listen to those around you. Further, maintain your calm and be respectful of others. Conservation is a collaborative process.

We thank Tom for all his hard work, inspiration, and knowledge towards the conservation of native plants in Georgia. Georgia is a more beautiful place because of him. Let us continue his efforts to make Georgia more beautiful.

From Madison, Georgia to Madison, Wisconsin: We are connected by the Monarch Butterflies!



By Jennifer Haynes, Morgan County Primary School

In July 2019, two teachers from Madison, GA - Karen Spence, Project Based Learning (PBL) teacher from Morgan County Elementary School; and Jennifer Haynes, STEM teacher from Morgan County Primary School - attended the three-day North American Monarch Institute (NAMI) conference in Madison, WI.

The NAMI conference took place at the University of Wisconsin's Arboretum and was attended by teachers, agency educators, nature center instructors, and others from across the USA and Mexico. Several of the attendees work directly with the Monarch Butterfly overwintering sites in Mexico.

Day One featured activities and various speakers including Dr. Karen Oberhauser, the University of Wisconsin Arboretum Director, Katie-Lyn Bunney, Education Coordinator Monarch Joint Venture, Mike Rizo, US Forestry Service Program

Specialist, and Nancy Sheeha, Citizen Science Coordinator for Journey North. Day Two was a field trip to the Aldo Leopold Center in Baraboo, Wisconsin. Day Three centered on mini-lessons about using nature to teach students about science and conservation. It was a very busy three days, yet participants were able to connect and exchange ideas among themselves.

Back in Georgia, Jennifer Haynes and Karen Spence plan to have students participate in the Monarch Butterfly Symbolic Migration program. In this program, students create a paper butterfly with a note to send to students somewhere along the migratory route in Mexico in the fall, and those students return a paper butterfly with a note back to the students in the spring. Students at Morgan County Primary School will also be tagging the Monarch Butterflies that come through their school garden in September. Students will upload the tagging information to the Monarch Watch website and later, if any of the butterflies are found in Mexico, students will be able to view that information online. It is exciting for our students to engage in real-world Citizen Science with students across our continent!

Pollinator Habitat Certification

Do you enjoy watching and studying caterpillars on their host plants; searching for chrysalides hidden from predators; observing butterflies and hummingbirds flitting from flower to flower? Does your schoolyard, workplace or backyard have bushes, trees and flowers that provide host plants, nectar and protection for butterflies, bees, hummingbirds and other pollinators? Is there a source of water/puddling areas for thirsty butterflies? Are there places for them to roost at night? If so, you might want to look into registering your backyard/schoolyard/workplace habitat with **Monarchs Across Georgia's Pollinator Habitat Program**. No garden is too big or too small!

For more details and to download the form, visit the [Pollinator Habitat Certification webpage](#).

Congratulations to the latest gardens to be certified!

Theresa and Hugo Dorfling – Ball Ground, GA

Emily Emerson & Samuel Stepp – Kansas City, MO

Cynthia Patterson – Marietta, GA

Diane F. Klonowski – Athens, GA

Brookwood Elementary School – Cumming, GA

Spade & Trowel Garden Club – Thomaston, GA

Georgann Schmalz – Dawsonville, GA

Donate to the Mexico Book Project

Every year MAG raises funds to purchase books for school children living in rural areas surrounding the monarch butterfly overwintering sites in Mexico. The small rural schools we support have limited supplies, and our contributions make a difference. You can contribute too! Donors have the option of receiving a donor certificate, which make great gifts for friends, family members or that special teacher. To learn more and to access the donor form, go to the [Mexico Book Project webpage](#).



Pancho Maya Kindergarten students were the recipients of books purchased with funds donated in 2018.

Apply Now for the MAG Awards!

The MAG Service Award recognizes significant contributions to monarch education, conservation, and/or habitat restoration in the state of Georgia. Two Service Awards are available: one for an individual engaged in formal or informal education, and another to recognize a facility.

The Pollinator Habitat Award will recognize a MAG certified pollinator habitat that goes above and beyond the minimal certification criteria and has been established for at least three years.

[Links to the award applications and scoring rubrics will be on the awards page.](#)

The submission deadline is February 7, 2020. Only one nomination per person or facility, please!

Recommended Resource

Flight of the Butterflies – a natural history epic in movie form

This movie on the monarch butterflies' incredible life can be called a scientific adventure story, showcasing Dr. Fred Urquhart's efforts in monarch research, and how it took him almost 40 years to prove the most incredible migration on Earth. Made by an award-winning production team, this film followed the butterflies along their migratory routes from Canada, across the US and into Mexico. The crew filmed hundreds of millions of monarchs in their remote overwintering sanctuaries in Mexico in 2011 and again in 2012. With the technology of IMAX®, the film's visuals do justice to the incredible migration of the "super generation" of monarchs that travel from Canada to Mexico, to overwinter in a place they have never been!

Flight of the Butterflies is a visual treat that has replicated Dr. Urquhart's journey in January 1976 to the remote mountains in the Transvolcanic Belt of central Mexico, and his discovery of a butterfly that was tagged in Minnesota in August 1975. The film follows this butterfly, tagged "PS 597". It is nothing short of miraculous that Dr. Urquhart stumbled upon this butterfly within minutes of stepping into the sanctuary – there were around a billion butterflies overwintering in the groves at the time of his discovery!

As a young kid, Dr. Urquhart wondered where the butterflies spent the winter months, and soon his passion turned to a profession as a biologist and university professor. Along with his wife Norah, Dr. Urquhart founded the Insect Migration Association (now known as Monarch Watch), enlisting thousands of volunteers across North America to tag butterflies in order to track their migration route. Ken Brugger and Catalina Aguado were one of the first citizen scientists to work on monarch migration with the Urquharts, and they ultimately found millions of butterflies in January 1975 at an elevation of 10,000 ft above sea level on Cerro Pelón (at the border of the states of Mexico and Michoacán). Dr. Urquhart then made the trip to the remote Sierra Madre Mountains of Michoacán, Mexico in January 1976, and he discovered five minutes after his arrival a butterfly tagged PS 597 in Minnesota. The butterfly would have flown 2,000 miles and for at least two months to get there.

SPOTLIGHTS... For Your Pollinator Garden

Black Swallowtail (*Papilio polyxenes*)

This butterfly, belonging to the family Papilionidae, is frequently seen on herbs such as dill, parsley, fennel, etc. It is admired for its beauty, and is also known as parsnip swallowtail, parsley swallowtail, celery worm, and caraway worm.

Appearance: The adult butterfly has a wing span of 3 – 4 inches, with the females typically larger than males. Their upper wing surface is mostly black with two rows of yellow spots, and a conspicuous black bulls-eye in a larger orange spot on the inner edge of the hind wings. The sexual dimorphism is apparent from the upper surface of the wings – the males have larger and brighter yellow spots, and are smaller and lighter in females. Additionally, the area between the rows of yellow spots is powdery iridescent blue in females.



Comparison of male (left) and female (right) Black Swallowtail adults. Photo © Marj Rines

Distribution and Habitat: Black swallowtails are distributed throughout eastern North America, ranging from southern Canada, across most of the eastern and mid-western United States, and southwest into Arizona and northern Mexico. They are generally found in open lands, such as fields, deserts, roadsides, and suburban areas including weedy spots and gardens. They also prefer wet areas in marshes, prairies, fields, flat-woods, and pine savannas.

Host Plants and Lifecycle: The main hosts for the black swallowtail include plants of the carrot/parsley family Apiaceae and the rue/citrus family Rutaceae. Eggs are laid singly on the leaves of these host plants, and this stage lasts for 4-9 days, depending on the host plant species and the ambient temperature at the time. The caterpillar/larval stage last for 10-30 days. In gardens, caterpillars are commonly found on the leaves of the dill, parsley, fennel, or carrot. In the wild, they are seen on Queen Anne's Lace, poison hemlock, or lovage. The full-grown larvae are green with black transverse bands containing yellow spots. Then they pupate in head-up position, and stay in this stage for 9-18 days. They overwinter in the pupae stage, which are brown in color. Pupae formed in other seasons may be brown or green with yellow markings. The adult butterflies feed on nectar from flowers such as red clover, milkweed, and thistles. Adult males perch near host plants to look for females in open areas.

Osmetrium Defense: One of the most interesting aspects of the black swallowtail is its defense mechanism. Swallowtail larvae have eversible horn-like glands located mid-dorsally behind their head called osmetria. These are bright yellow-orange in color. When threatened, the larvae rear-up and extrude the osmetria, in an effort to smear the predator with a chemical repellent. The repellent has a pungent odor, and is effective in driving away ants and small spiders.

Managing swallowtail caterpillars: Even though black swallowtail caterpillars feed on a variety of cultivated plants, they are not sufficiently common to be a problem for commercial agriculture. For controlling their population in home gardens, hand-picking is recommended.



Caterpillar extruding osmetria.
Photo © Lewis Scharpf

SPOTLIGHTS... For Your Pollinator Garden

Golden Alexander (*Zizia aurea*)



Photo Credit: Montale Gardens

This short-lived perennial forb belonging to the carrot family Apiaceae is attractive to many kinds of butterflies and insects. It is a native host plant for the black swallowtail, which is often seen on parsley, dill, fennel, and carrots. It is also one of the plants frequently used when planting for habitat conservation and in wildflower gardens. This species is widely distributed from Quebec to Saskatoon, south to Florida and Texas.

Preferred habitats of the golden alexander include moist black soil prairies, openings in woodlands with moist to mesic environments, savannas, thickets, limestone glades and bluffs, abandoned fields, and even power line clearings in wooded areas. While it prefers wet soils, it is tolerant of dry conditions in the summer. It grows in full to partial sun, but tolerates light shade under trees.

The flowers of the golden alexander are tiny, bright yellow colored, and form umbrella shaped clusters. It is notable that the flowers provide easy access to pollen and nectar to many beneficial insects with short mouth parts.

The attractive flowers occur from May – June. Each flower is less than 0.3 centimeters long, with 5 sepals, 5 petals, and 5 stamens. A cluster of flowers form a flat-topped flower head. The flowers give way to oblong green fruit capsules. Leaves as well as the fruit turn purple in the autumn season. Seed capsules ripen slowly in the flattened heads. They stay green for most of the summer season, gradually darkening to burgundy and then brown color when they can be removed and crushed to release the dark brown seeds. These will then germinate after 90 days of stratification in cold conditions. The resulting seedlings can be transferred to containers by midsummer, following which the plants will be at flowering size by the following spring. These containerized seedlings are best planted in the spring or early fall. While unstratified seeds may be planted in fall, germination cannot be guaranteed.



MONARCH JOINT VENTURE

Partnering across the U.S. to conserve the monarch migration

www.monarchjointventure.org

The Monarch Joint Venture is a partnership of federal and state agencies, non-governmental organizations, and academic programs that are working together to protect the monarch migration across the lower 48 United States.

MISSION

Recognizing that North American monarch (*Danaus plexippus*) conservation is a responsibility of Mexico, Canada and the U.S., as identified in the North American Monarch Conservation Plan, this Joint Venture will coordinate efforts throughout the U.S. to conserve and protect monarch populations and their migratory phenomena by developing and implementing science-based habitat conservation and restoration measures in collaboration with multiple stakeholders.

Our mission will be achieved by coordinating and facilitating partnerships and communications in the U.S. and North America to deliver a combination of habitat conservation, education, and research and monitoring.

VISION

The vision of this Joint Venture is abundant monarch populations to sustain the monarch migratory phenomena into perpetuity, and more broadly to promote monarchs as a flagship species whose conservation will sustain habitats for pollinators and other plants and animals.

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Rearing Monarchs: Why or Why Not?

Rearing and Conservation

In the face of monarch population declines, passionate conservationists are fighting to save this winged icon. Rearing monarchs in classrooms and homes has been a valuable educational tool for teachers and for citizen science. Unlike many wildlife species, monarchs are easily reared and offer an up-close look at metamorphosis. As monarch populations have declined, some people have promoted rearing and releasing, and even purchasing, monarchs on a large scale as an attempt to boost wild populations.

While captive rearing and release has been an important conservation strategy for some species, releasing reared monarchs is not likely to be an effective monarch conservation strategy and could have negative effects. Potential risks include releasing monarchs that are adapted to captive conditions, increasing parasites and disease in wild monarch populations, and making it more difficult to understand natural monarch distributions.

There is a lack of scientific evidence that monarch rearing actually results in overall population increases, and it is known to carry risks. Many experts do not support large scale captive rearing for conservation purposes. Recommended strategies that do support monarch populations in the long-term include creating or improving habitat, minimizing monarch and habitat exposure to pesticides, and participating in citizen science or other research. However, there is little risk in responsibly raising a few monarchs for enjoyment, education, or citizen science, which can lead to stronger human connections with and better understanding of this amazing species.

Disease Concerns

Captive rearing often involves raising monarchs at higher densities than they occur in the wild, and repeated re-use of the same containers. Monarchs did not evolve under high density conditions, and thus caterpillars reared in close proximity to one another are highly susceptible to disease transmission. Re-use of the same rearing materials can allow parasites and pathogens to accumulate over time. If unhealthy monarchs survive rearing and are released into the wild, they could transmit diseases or parasites to wild monarchs, risking adverse effects on an already vulnerable population. Unhealthy monarchs may also experience lower survival, reproduction, and migration success relative to healthy butterflies.

Natural Distribution Concerns

Effective conservation requires understanding population distributions. If monarchs are seen in unusual places or times, we can learn about their movement patterns and habitat use. However, if the observer doesn't know if an unusual sighting involves a captive-reared monarch, our ability to understand natural population distributions is compromised.

Genetic Concerns

Species bred in captivity can adapt to captive settings in just a few generations. Differences in temperature, food, predation and density between wild and captive settings can favor different traits related to development rate, body size, feeding behavior, and defenses. Frankham (2008, [doi:10.1111/j.1365-294X.2007.03399.x](https://doi.org/10.1111/j.1365-294X.2007.03399.x)) suggests these genetic adaptations are overwhelmingly harmful when offspring of multiple generations of captive breeding are returned to the wild.

For more information about issues with captive breeding and mass releases, visit <http://bit.ly/captivebreeding>.



Rearing Monarchs Responsibly

If you do rear monarchs for educational or citizen science purposes, we offer this guidance for responsible rearing.

Collect small numbers of monarch eggs or caterpillars from the wild as locally as possible. Do not buy or ship monarchs; be mindful of collection policies or restrictions if applicable and secure permission before collecting monarchs from the wild.

Monarch caterpillars require milkweed to grow and develop; there are over 100 species of milkweed native to North America. Look for eggs or larvae on the underside of milkweed leaves; they are also commonly found amongst buds or flowers at the top of the plant. When you find a caterpillar, remove the whole leaf on which you find it and transfer it to your rearing container. You need a reliable source of milkweed to feed larvae. When collecting milkweed, avoid plants that have been treated with insecticides.

Rinse leaves before feeding them to caterpillars. Rinsing will clean the leaves, and keep them fresher for longer. You should blot off extra water, and can keep extra leaves in an airtight container in your refrigerator. **Precaution:** Latex from milkweed is painful and can cause corneal damage if it is rubbed into eyes. Avoid touching your eyes and wash your hands after handling milkweed.

All reared monarch observations should be submitted to the Monarch Larva Monitoring Project (www.mlmp.org). Test adult monarchs for the OE parasite with Project Monarch Health (www.monarchparasites.org).



Egg (1-5 days)

To keep the milkweed from drying out, keep eggs (on the milkweed on which you collected them) in a container lined with a moist paper towel.

Larva/Caterpillar (10-14 days)

Monarch caterpillars can be kept in an aquarium, large jar, bug cage, or other roomy containers. Rearing containers should have adequate ventilation, which can be provided by a screened lid or sides. The container should be large enough for the adult to expand its wings when it emerges. To minimize disease spread and keep accurate records for citizen science projects, it is best to raise monarchs singly (one per container). Overcrowding monarchs can lead to starvation, cannibalism, rapid spreading of disease, and death. Keep rearing containers clean and sterilize after each use (when a monarch emerges as an adult, or dies) using a 20% bleach solution.

Continue to keep a damp (NOT dripping wet) paper towel at the bottom of the container. Replace it often to prevent the buildup of waste. Protect the container from direct sunlight; high temperatures can kill larvae. Some larvae collected from the wild will have tachinid fly parasitoids, which emerge from monarchs around the time of pupation. Send emerged flies to MLMP, using their protocol.

Mortality may be caused by a virus or bacterial infection, or by contaminated milkweed. Handle larvae as little as possible to avoid hurting them or spreading disease. Very small larvae may be moved with a small, clean paintbrush. Caterpillars that stop moving and turn brown or black should be removed immediately; they could rupture and spread infection. Remove dead or unhealthy pupae and caterpillars from the rearing containers as soon as you see them, and sterilize the container. You may keep them in a separate container for a few days to determine if they are parasitized.

Photos: Tom Collins, Diane Rock, Kaitlyn Creasey, Wendy Caldwell



Caterpillars that are motionless on the side or top of the cage (not feeding) are especially vulnerable to injury because they are probably preparing for or recovering from a molt. Be careful not to disturb or move them during these periods of apparent inactivity. When ready to pupate, larvae will crawl to the top of their cage, attach themselves with silken thread, and form a pre-pupal 'J' before shedding their skin for the last time.

To reduce risk of spreading the protozoan parasite OE (*Ophryocystis elektroscirrha*), and other diseases, do not keep adults in the same container as immatures, and do not allow adults to emerge in a container in which larvae are feeding. Adult monarchs can spread dormant parasite spores to milkweed plants and to their eggs. When a caterpillar consumes these spores, they become infected.

Pupa/Chrysalis (9-14 days)

To re-attach a fallen pupa, tie a piece of thread or floss around the cremaster (small black attachment at top) and secure it to a lid.

The day before adults emerge, their wings become visible through the pupal skin. Adult butterflies usually emerge in the morning; their wings will be soft and wet when they first emerge. If they fall, carefully pick them up by holding the thorax (body segment to which the legs are attached), and place them on the top or side of the cage. They need to hang with their wings pointed downwards for several hours. A pupa that has been very dark for more than 2 days is likely dead.

Adult Butterfly



Recently emerged butterflies should be tested for the protozoan OE (Project Monarch Health), and can be kept in the cage for up to a day before being released or fed. Monarchs held for longer than one day need to be fed nectar. If flowers are not available, you can offer a clean sponge or cotton ball saturated with a 20% honey or sugar water solution. A warm sunny day is an ideal day to release them. Hold the butterflies carefully with their wings closed when you release them, or simply open the cage to let them fly out. Release adults close to where they were collected as eggs or caterpillars - do not translocate them long distances.

Quick Tips for Raising Healthy Monarchs

Keep the cage clean. Rearing containers need to be cleaned of frass and old milkweed daily to prevent mold growth. Clean containers with a 20% bleach solution and rinse before putting monarchs inside.

Keep milkweed fresh. Add fresh milkweed every day to ensure monarch larvae have quality food.

Avoid extreme temperature and moisture conditions. Keep rearing containers out of direct sunlight and make sure that there is not too much moisture (paper towel should be moist, but not dripping wet). Temperatures that are too cold will delay monarch development. If the container is in direct sun, it will act like a greenhouse, and heat up to potentially lethal temperatures.

Be conscious of disease. Viral and bacterial infections spread very quickly from one caterpillar to another, so keep containers clean and sterilize them often.

Why to rear (or not)? Mass rearing of monarchs for release into the wild is not an appropriate conservation strategy. People who wish to rear monarchs should do so in small numbers, for outreach, personal enjoyment, or citizen science.