

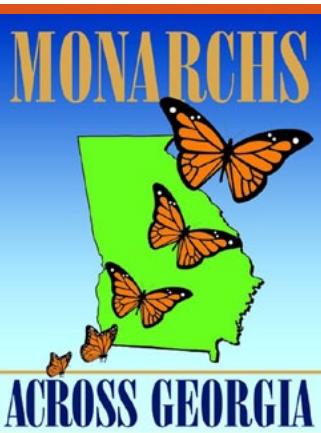
The Chrysalis

Emerging News

from Monarchs Across Georgia



A Committee of the Environmental Education Alliance of Georgia



Upcoming Events

Outdoor Learning Symposium

September 21-22
8:00am - 4:00pm

Gwinnett Environmental & Heritage Center, Buford
Participate in sessions and hands-on learning to give you confidence teaching outdoors.

An *Our Shared Forests* curriculum workshop will be offered on Saturday.

Wildlife Plant Sale

October 6 • 9:00am - 2:00pm
Roswell City Hall, Roswell
Purchase native perennials and shrubs for your wildlife garden, as well as host and nectar plants for butterflies and other pollinators, including milkweed! For more information call 770-641-3742.

Environmental Education Alliance of Georgia Annual Conference

"21st Century Communication for Environmental Educators"
March 22 - 23
Classic Center, Athens

Monarch Mania Hits Minnesota!

Science-fiction fans gather annually in Atlanta, GA, for Dragon*Con while comic book buffs mark their calendars for Comic-Con in San Diego, CA. Where do butterfly enthusiasts go to indulge their passion for monarchs? To Mon-Con, of course! On June 21 – 23, over 170 biologists, educators, citizen scientists, students, land managers authors, film-makers, conservationists, and butterfly gardeners descended on Minneapolis, MN, to take part in the 2012 Monarch Biology and Conservation Meeting hosted by the University of Minnesota Monarch Lab. Appropriately, the meeting was held during Pollinator Week, an annual global event to draw attention to the plight of the world's pollinators - bees, butterflies, bats, beetles, birds and other creatures that support the reproduction of over 70% of all flowering plants. Previous conferences were held in Morelos, Mexico (1981); California, USA (1986); Michoacán, Mexico (1997); and Kansas, USA (2001). This fifth international conference (dubbed Mon-Con for short) featured 32 oral presentations, over 50 poster sessions, and a variety of field trips and workshops all devoted to 1) monarch monitoring programs and population trends; 2) new findings in monarch biology; or 3) successful monarch conservation efforts. It drew attendees from over 30 U.S. states, Canada, Mexico, Spain, and Australia.



Susan Meyers, Treicia Neal, and Kim Bailey represented Monarchs Across Georgia at the 2012 Monarch Biology and Conservation Meeting held June 21 – 23 in Minneapolis, MN.

Three Georgia scientists shared their research related to monarch biology. Dr. Sonia Altizer from the University of Georgia (UGA) School of Ecology discussed "Migratory Immunity: Parasite Infection, Host Defense and Fitness Costs" while Andy Davis, also from UGA, gave a

Continued on Page 2

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presentation titled "The Redder the Better: Subtle Variations in Monarch Wing Color and Fitness." Dr. Jacobus de Roode from Emory University presented "Monarch Butterflies and Anti-parasitic Milkweed" and explained his findings showing parasite-infected female monarchs show a strong preference for laying eggs on a variety of milkweed that acts as a medicine to weaken parasites in the monarch's offspring. These and other conference presentations are now available online at www.monarchlab.org/mn2012/Presentations.aspx.

A highlight of the meeting was the keynote address, "A 58-Year Journey with the Monarch" presented by legendary monarch researcher, Dr. Lincoln Brower. Known and respected by scientists and educators alike, Dr. Brower's research interests include the overwintering and migration biology of the monarch butterfly, chemical defense, ecological chemistry, mimicry, scientific film making, and the conservation of endangered biological phenomena and ecosystems.



Middle schoolers demonstrate the "Monarch Larva Monitoring Project" protocols and share their own research findings with Mon-Con participants.

than 200 scientific papers, eight films, edited two books, and is currently writing his magnum opus on the monarch butterfly for Harvard University Press. Instead of summarizing his vast past research, Dr. Brower focused on the results of his latest findings collected during last fall's monarch migration through drought-stricken Texas.

In addition to all the scientific presentations,

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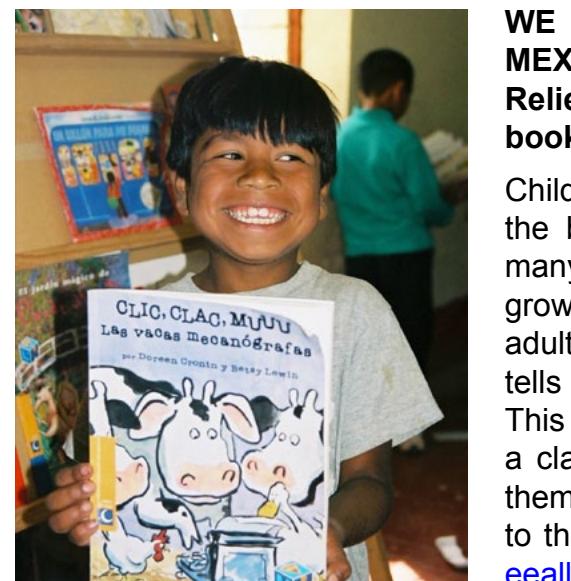
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conference participants were treated to a sneak preview of a new IMAX®/Giant Screen film currently in production, Flight of the Butterflies. Promoted as "an awe-inspiring tale of extraordinary insect endurance and human perseverance," the film is two stories intertwined. It's about the astounding monarch butterfly migration, the longest known insect migration on earth, and Dr. Fred Urquhart, the determined Canadian scientist who spent almost 40 years working to discover exactly where the butterflies mysteriously went when they flew south for winter. The film is due to be released in October 2012. Check www.flightofthebutterflies.com for the latest updates and to find a theatre near you.

Between engaging in meeting activities, Mon-Con participants also took advantage of every moment including breaks, meals, and shuttle rides to network, share stories, and learn from each other. Three delegates from EEA's own Monarchs Across Georgia (MAG) steering committee, Kim Bailey, Susan Meyers, and Trecia Neal, consider themselves extremely fortunate to be in attendance and representing MAG. "It was wonderful to meet so many others who share the same intense enthusiasm for monarchs we do and quite inspiring to see how they've shared their passion with others. We met a simply amazing group of people," says Kim Bailey. Kim was particularly impressed by a group of middle school students who were spending the summer researching their own questions related to monarchs and milkweed – as well as the teacher giving her time to mentor them. Susan reflected, "What a great experience and opportunity to network! Although MAG was already connected to the existing monarch citizen science programs, we made some stronger relationships by meeting face-to-face. Trecia and I were invited to become Monarch Watch conservation specialists (www.monarchwatch.org/cs/). Kim and I were invited to write an article about MAG and environmental education to be included in a post Mon-Con

book. Through a special promotional campaign tied to Journey North's Symbolic Migration project, Bas Relief Publishing will be selling and sending books to Mexico for the 2013 Mexico Book Project. Could it get any better?" Trecia added, "It was so wonderful to see so many old friends from our frequent travels to Mexico again and to hear the newest research taking place from all over the world on Monarch biology and ecology. The conference energized me with many ideas for projects to bring back to Georgia and I am looking forward to working with the MAG committee again to begin to implement some of them!" The conference coordinators' greatest hope is "the interactions between the people who gathered to promote and share research, conservation, and educational activities will support the continued health and well-being of North America's favorite insect."

While Mon-Con participants definitely take their butterflies seriously, don't think they don't also know how to have fun! Dragon*Con may be famous for its spectacle of costumes, but Mon-Con had its own informal parade of Monarch T-shirts in an astonishing variety. Some attendees took things a step further by adorning themselves in monarch fashions from head to toe... and even to fingertip! (See photo above). When and where will the next Mon-Con be held? Who will host it? No definite plans have been made yet, but the rumor is right here in Georgia. If so, watch out Dragon*Con - monarch mania may be coming to town!



At this link, you will also find an on-line form to make donations directly to the Project, allowing us to send other book titles to the schools in the areas that surround the monarch sanctuaries.



The Mexico Book Project

WE ARE PROUD TO ANNOUNCE AN EXPANSION OF THE MEXICO BOOK PROJECT THIS YEAR! Journey North and Bas Relief Publishing are joining forces with MAG to bring more books to Mexico.

Children who live near the monarch reserves in Mexico welcome the butterflies every winter, but they rarely experience what so many children in the United States and Canada do—caterpillars growing, eating milkweed, turning into chrysalides and emerging as adult monarch butterflies. The book "Monarch! Come Play with Me" tells the story of the monarch life cycle from a child's point of view. This is an opportunity to send the Spanish version of the book to a classroom in Mexico and share your monarch experience with them. In appreciation, a bookplate with your name will be attached to the inside cover. To place an order for these books, visit www.eealliance.org/mexico-book-project.

Can Milkweed be Medicine?

We usually think of medication as a purely human construct - something that we do because we know when our bodies need a boost to our physical health. Even more complex might be the idea of preventative medication - measures that we take to prevent an illness that we haven't even experienced yet. Rarely do we think of animals having that sort of foresight. Of course, there are well documented examples of elephants eating dirt to obtain the sodium lacking in their diets, and macaws eating clay from exposed riverbanks to help neutralize toxins found in the seeds and fruit they consume. In the hierarchy of animal intelligence, we would probably rank elephants and macaws somewhere near the top, so maybe this isn't so much of a surprise. What is a surprise is that this phenomenon has now been documented in insects. Scientists Thierry Lefevre, Lindsey Oliver, and Jacobus de Roode from Emory University, along with Mark Hunter from the University of Michigan, recently discovered that monarch butterflies may prefer certain species of milkweed over others because of their ability to reduce parasite growth. And even more astonishing - this is the first evidence of trans-generational medicine, where individuals are not healing themselves, but taking preventative measures for their offspring.

Ophryocystis elektroscirrha, or Oe, is a protozoan parasite that affects monarch (*Danaus plexippus*) and queen (*Danaus gilippus*) butterflies. It is present as spores between the butterfly's wing scales and on the abdomen, and may be transferred from female to offspring when the spores are scattered on the milkweed leaves that she lays her eggs on. They enter the caterpillar's body when it eats the milkweed, eventually hatching into sporozoites inside the caterpillar's body. Although some caterpillars may die as a result, most will pupate. Oe begins to reproduce inside the chrysalis, and as a result the adult butterfly emerges covered in spores. Some of these adults survive long enough to mate and

lay eggs, thus continuing the Oe lifecycle. The parasite is widespread, being found in every monarch population on the planet, although it is more prevalent in non-migratory populations, such as that in Florida.



Ophryocystis elektroscirrha (Oe) is seen as tiny, sesame seed shaped spots on this microscope slide. The larger, petal-like shapes are the individual scales from the Monarch's wings.

Thierry et al. discovered that neither adult butterflies nor caterpillars could cure themselves of this disease; however, they preferentially laid their eggs on milkweed species with higher cardenolide (a toxic steroid) concentrations. They performed three separate experiments - larval feeding choice, adult oviposition (egg-laying) choice, and host plant effects on monarch and parasite fitness.

Experiment 1: Larval feeding choice

Caterpillars, both infected and uninfected with Oe, were offered a choice of swamp milkweed (*Asclepius incarnata*) or mexican milkweed (*A. curassavica*) leaves. *A. curassavica* has a markedly higher cardenolide concentration than *A. incarnata*. Neither the infected nor uninfected caterpillars showed a preference for one species

Continued on page 5

Continued from page 4

over the other, indicating that caterpillars are unable to self-medicate.

Experiment 2: Adult oviposition choice

It was found that infected and uninfected females did not differ in the amount of eggs they laid. However, when offered both *Asclepius* species as hosts for their offspring, the infected females showed a strong preference for the anti-parasitic *A. curassavica* over *A. incarnata*. Uninfected females did not show a preference. Furthermore, it was found that individual females were fairly consistent in their choice over consecutive egg-laying trials. These results show that infected females show a strong preference for the species that would alleviate the disease symptoms in their offspring - essentially partaking in preventative medicine.

Experiment 3: Host plant effects on monarch and parasite fitness

The reproductive capability of Oe was tested on caterpillars raised on *A. curassavica* and those raised on *A. incarnata*. It was found that lower spore loads were produced in the caterpillars that ate *A. curassavica*. As a consequence, infected monarchs that ate *A. curassavica* as larva had longer life spans than those who ate *A. incarnata*. So it seems that while a higher toxicity level did not prevent an Oe infection completely, it did lessen the effects of the parasite on the adult butterfly.

The same experiment was performed on uninfected caterpillars. Surprisingly, uninfected individuals lived longer when raised on *A. incarnata*, indicating that while *A. curassavica* may inhibit parasite growth, there is some other cost to feeding on it.

So what does this mean?

While monarch individuals cannot heal themselves of the parasites they carry, they seem to have some "sense" (for lack of a better, non-anthropomorphic term) for the preservation of their species. There is some instinct that compels an infected female to lay her eggs on a plant that reduces illness for

future generations, even if it means that each individual caterpillar may have a shortened life span. It seems that environmental conditions can have a huge effect of parasite virility, and that the hosts can directly alter these pressures.

Despite these findings, study co-author Jacobus de Roode cautions gardeners against planting non-native milkweeds such as *A. curassavica*. It is available from many plant nurseries, but scientists are concerned that it has negative impacts on monarchs, such as altering the migration patterns. To avoid the potential risks, plant native milkweeds instead. Learn more at www.mlmp.org/Newsletters/yearly/mlmp_newsletter_2010.pdf (see page 12). When buying plants, ask if they have been treated with systemic pesticides, such as neonicotinoids, which persist in plant tissues and can harm or kill insects that feed on them. Some nurseries use these practices to produce unblemished plants for sale.

These findings also support the theory that the evolution of animal behavior is heavily driven by this "sixth sense". The gene that causes this behavior survives because it enhances the survival rate for the offspring that carry it. The mechanism by which the infected females carry out the selection of host plants is unknown, but it has been proposed that perhaps the "taste" receptors on the butterflies feet and antennae are altered due to the parasite load.

Looking beyond just the study of butterflies, the implication that female monarchs are able to somehow detect anti-parasitic substances may further benefit human medicine, as humans can be affected by parasites related to Oe, such as *Cryptosporidium* and *Plasmodium spp.*

Read the original study, "Evidence for trans-generational medication in nature", originally published in the journal *Ecology Letters* (2010) 13: 1485–1493 by Thierry Lefevre, Lindsay Oliver, Mark D. Hunter and Jacobus C. de Roode



MONARCHS ACROSS GEORGIA POLLINATOR HABITAT GRANT

Monarchs Across Georgia is pleased to announce the availability of grants up to \$750.00 for creating and utilizing certified pollinator habitats. Projects must create or enhance an outdoor habitat that fulfills the specific requirements of the Monarchs Across Georgia Pollinator Habitat Certification. Certificate and sign will be awarded when project is complete. The project must also include an educational component (signage, brochure, program, outreach, etc.) regarding pollination and promote the Monarchs Across Georgia Pollinator Habitat Certification Program.

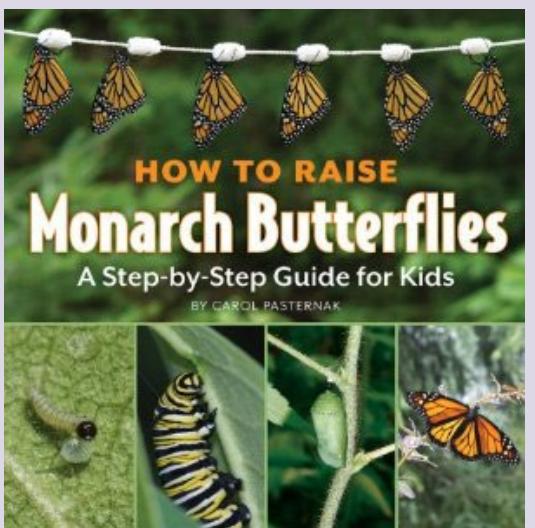
Eligible applicants are teachers, employees or volunteers associated with a public or private non-profit school, nature center, park, library, senior citizen center, long-term care facility, farm or plant nursery. Applicants must also be members of the Environmental Education Alliance of Georgia (EEA) through the grant period. Grant applications may be submitted online by November 15, 2012. Please visit the Pollinator Habitat Grant link at <http://www.eealliance.org/mag>.

Recommended Reading

How to Raise Monarch Butterflies: A Step By Step Guide for Kids by Carol Pasternak

Observing a monarch butterfly as it transforms itself from a black, white and yellow caterpillar and emerges from a chrysalis as a vivid orange, black and white butterfly is among the most thrilling experiences that nature offers. Raising monarch butterflies from eggs collected from milkweed leaves, or from caterpillars plucked from the plant, is made easy with the help of this detailed guide to locating and hatching this distinctive insect.

With more than 50 unique, close-up photographs readers will learn about the life cycle of the Monarch and how to encourage populations in their own backyards, with tips on which plants to grow, as well as the care and feeding of their pet caterpillars. "How to Raise Monarch Butterflies" explains what threats face Monarchs and how readers can help conserve the Monarch's feeding grounds from encroachment.



Reminder!

The deadline for Symbolic Migration is October 12, 2012.

Teach lessons of conservation and ambassadorship by having your students send paper monarchs to Mexico, mimicking the real monarch migration! For more information, go to www.learner.org/jnorth/sm/index.html

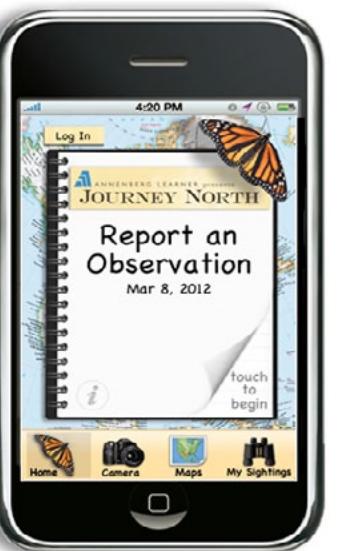


And also...

Journey South is Underway!

The fall migration has begun! Monarchs in eastern North America are beginning to make their way towards the mountains of central Mexico. Be a part of the world's largest insect migration by reporting your monarch sightings online.

Your observations will help scientists answer questions about this amazing journey. Go online to www.learner.org/jnorth/monarch/index.html to see how you can participate.



You can now enter your sightings in the field with Journey North's new mobile app! Go to www.learner.org/jnorth/mobile/index.html for more details.

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? Then you might want to apply to certify your backyard/schoolyard/workplace habitat

with Monarchs Across Georgia's Pollinator Habitat Program. For more details and to complete the on-line application, visit the Pollinator Habitat Certification link on www.eealliance.org/mag.

Congratulations to the latest gardens to be certified:

**Julia Bartlewski &
Druid Hills Middle School,
Decatur**

**Deborah Patton, Douglas
Joy Roberson, Douglas**

SPOTLIGHT... Plants For Your Pollinator Garden

Cardinal Flower (*Lobelia cardinalis*)

A native perennial with brilliant red flowers • Grows 12-16" • Full Sun to Partial Shade • Zones 2-9

In the 1940s the New York Botanical garden surveyed 1,000 botanists and naturalists throughout North America, asking them to list the “most showy, conspicuous, and interesting wildflower” in their regions. The Cardinal Flower received the most votes and was deemed “America’s favorite”.

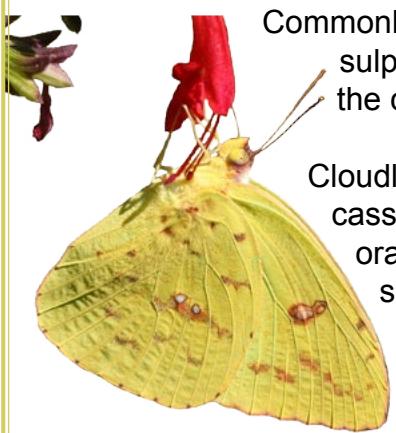
You will usually find this native growing near a stream or bog. It's extremely showy blossoms can be recognized at considerable distance. Few native plants have flowers of such intense color as this common herbaceous perennial. The tubular cardinal red flowers last 4 to 6 weeks and are a favorite with hummingbirds, swallowtail and sulphur butterflies. *Lobelia cardinalis* is best planted in rich moist soil in full sun to light shade. The Cardinal flower will tolerate normal garden soil provided it is planted in partial shade and mulched. In the winter the basal rosettes need sunlight so remove any fallen tree leaves or mulch. When well established, clumps of this plant can be divided in the fall or spring by separating the rosettes or basal offshoots from the mother plant and replanting these divisions and watering them immediately.



To quote Allan Armitage's book, *Garden Perennials*: “To see dozens growing together in a colony is to have an out-of-body experience.” Check with your local garden center for seeds in early spring. Plants are usually available in mid to late May.

Virginia Brewer
Lavender Mountain
HARDWARE
and garden

Species Profile: Cloudless Sulphur (*Phoebis sennae*)



Commonly seen fluttering along open areas in the deep South, the cloudless sulphur is a bright yellow butterfly that is often mistaken for its similar cousin, the clouded sulphur.

Cloudless sulphurs host on members of the pea (*Fabaceae*) family, usually cassia or senna, laying a single egg on each plant. The egg eventually turns orange and hatches after six days. The caterpillar is green with black splotches and prominent black bumps across its back, although when they eat the yellow flowers they turn yellow as well. An interesting adaptation of the caterpillar is its leaf tent building skills, allowing it to better protect itself within the host plant. The chrysalis is sharply pointed on both ends with a domed center, resembling the cassia leaves in which it is hidden,

and can be green to brown with pink or yellow stripes. Adults of both sexes have clear yellow upperwings, but females have a prominent silver spots edged in pink on their underwings (males have smaller spots). The butterflies always perch with the wings folded back. Although some individuals can be found as far north as New England, they do not breed or overwinter there.