

the Thalweg

Watershed Stewardship Program

Winter 2016

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News from the Garden

The Watershed Stewardship Program is pleased to announce a new addition to our Wildlife & Rain Garden: interpretive signage! Thanks to a generous grant from the Royal Bank of Canada, we have installed interpretive signs throughout the garden. These markers will help guide visitors and provide education, such as stewardship and gardening tips, pollution prevention, and natural history information. The signs are classified by topics, including wildlife habitat, landscaping for diversity, and stormwater control. Each sign also features a beautiful illustration by David Short, a former art and design professor at Kennesaw State University.

We hope that you will visit the Wildlife & Rain Garden to tour the garden and view the new interpretive signs. Stop by during our garden work days for a guided tour, typically every Thursday from 8:30-10:30am or 9:00-11:00am during the cooler months. You can also call or email to schedule a garden tour: 770-528-1482 or water_rsvp@cobbcounty.org.

In honor of our new interpretive garden signs, please enjoy the following winter gardening article by Arty Schronce of the Georgia Department of Agriculture.

from *Arty's Garden*

Plant for Winter Beauty and Interest

What do you enjoy most about your garden between Thanksgiving and Valentine's Day? If you say nothing except the rest from weeding in the hot sun, you are missing a whole season's worth of beauty.

What can be attractive about a garden in winter? Fruits, foliage, bark, and even flowers are all part of making a winter garden beautiful.

Flowers in winter? Certainly! Camellias, laurustinus, winter jasmine, wintersweet, witch hazels, paperwhites, hellebores, Algerian iris, pansies, and violas are a few plants that will flower in the Georgia winter.

Winter jasmine's (*Jasminum nudiflorum*) yellow flowers contrast with its blue-green stems. The shrub's arching habit makes it ideal for planting on banks and to cascade over walls.

The winter-flowering cherry (*Prunus subhirtella* 'Autumnalis') blooms sporadically all winter, depending on the weather, with peak of flowering in spring.



Continued on page 3

Climate change could cause cold-blooded animals' thermal tolerance to shrink

San Francisco State University
Originally released on May 19, 2015

Behavioral or evolutionary changes may be "best hope" for survival, SF State study suggest

Cold-blooded animals can tolerate body temperatures only a few degrees above their normal high temperatures before they overheat, which could be a problem as the planet itself warms, according to San Francisco State University researchers.

Ectotherms such as fish, reptiles, and insects can stretch their body's tolerance of high and low temperatures a little bit at each extreme, but that stretch, or plasticity, is relatively small, the scientists found. As a result, the animals will see their "thermal safety margins" shrink as global temperatures rise, said postdoctoral researcher Alex Gunderson and Professor of Biology Jonathon Stillman, of SF State's Romberg Tiburon Center for Environmental Studies.

A land-dwelling ectotherm such as a lizard could increase its thermal tolerance by about one degree only after experiencing an increase in environmental temperatures of 10 degrees, making it difficult to keep pace with rising temperatures, Gunderson noted. As a result, shifts in behavior or evolutionary changes "might be their best hope if they reach a point where they're being really challenged by climate change," he added.

However, animals that live in water might not have as many options as land animals for changing their behavior, the researchers note, and it's unclear how long it might take most ectotherms to evolve tolerances to higher temperatures.

The study, published May 19, 2015 in the Proceedings of the Royal Society B, examined thermal plasticity in 232 species of insects, crustaceans, fish, amphibians, and reptiles. Thermal plasticity is a measure of the "wiggle room" that an animal has at extreme temperatures, where it can maintain its normal functions even as outside temperatures rise or fall above the animal's optimal body temperature.

Researchers have assumed that this plasticity follows certain patterns among ectotherms. For instance, daily and seasonal temperatures vary more widely at higher latitudes, so it might make sense for higher-latitude ectotherms to have higher plasticity to track those variations. At the same time, animals living at lower latitudes might be expected to have less plasticity, since they would experience fewer temperature fluctuations in the tropics.

Scientists, including Stillman, have also proposed that ectotherms that can thrive in the hottest temperatures would have the least amount of plasticity, since they might be at the limits of thermal tolerance already.

"Our data set is really the first one to compile a comprehensive analysis across ectotherms generally, to see whether these patterns hold up," Gunderson explained. He and Stillman were surprised to find that they did not. For instance, the researchers found no strong link between latitude and thermal plasticity when it comes to high temperatures.

Gunderson said animals living at higher latitudes might not have as much built-in ability to stretch their heat tolerances because they can instead change their habits to cope with extreme temperatures by doing such things as taking shelter in shade during the hottest part of the day.

"What we propose is that the ability of animals to mediate their thermal environment through their behavior is buffering them" against temperature variations, Gunderson noted.

"This research represents a great scientific process of testing hypotheses with larger and more comprehensive data sets," Stillman added. "What we know to be true about diversity and adaptation of thermal tolerances when looking at specific groups of animals is not necessarily true when expanded across all animals."

The researchers did see more thermal plasticity associated with changes in latitude at the coldest end of the temperature range, perhaps because there aren't as many ways for animals to "behaviorally buffer themselves against cold temperatures," Gunderson said. Ectotherms typically experience lowest temperatures at night, when there is less overall temperature variation and the animals can't do things like vary the amount of sun they soak up.

Gunderson and Stillman also found that aquatic animals have higher levels of thermal plasticity than terrestrial animals. This may be because they live in an environment with less temperature variation and fewer options for protecting themselves through behavioral changes, such as using trees for shade.



A lined shore crab, one of the crustacean species studied as part of Alex Gunderson and Jonathon Stillman's latest research. Credit: Nate Miller

Gunderson said he and Stillman would like to pair their study's plasticity data with a map of daily and seasonal fluctuations in temperature at several locations around the globe. That data, along with predictions of how temperatures might change in those areas as the planet warms, could tell the scientists more about what temperatures an ectotherm species could tolerate in the future.

In order to make the most "generalizable results useful for accurate understanding of species responses to climate change," says Stillman "broad studies like this one are really important."

"Plasticity in thermal tolerance has limited potential to buffer ectotherms from global warming" by Gunderson and Stillman was published in *Proceedings of the Royal Society B* on May 19, 2015. For copies of the study, contact Jonathan Morales in University Communications at (415) 338-1743 or jmm1@sfsu.edu.

To read this press release online, go to <http://news.sfsu.edu/climate-change-could-cause-cold-blooded-animals-thermal-tolerance-shrink>.

WINTER BEAUTY... CONTINUED FROM COVER

ANOTHER WINTER-FLOWERING tree is the Japanese flowering apricot. You are just as likely to hear it called by its botanical name *Prunus mume* (pronounced PROO-nus MYOO-may) than its common name, however. Its flowers can be white, pink, or rose and are sweetly fragrant.

Fragrance is a hallmark of many winter flowers. One of my favorites is wintersweet (*Chimonanthus praecox*), a large shrub or small tree with yellow flowers and a fragrance that is a mix of bananas, vanilla, and spices.

Another favorite are witch hazels. They have a clean, spicy scent uniquely their own. Flower colors range from yellow to orange and red depending on species and variety.



Japanese flowering apricot (*Prunus mume*)
Credit: www.missouribotanicalgarden.org

Flowers are not necessarily the main contributors of color to the winter garden. Orange, red, gray, yellow, white, purple, and blue can be found in the fruits of many plants. Hollies, wax myrtle, aronia, and viburnums are a few plants whose fruits add color. They also attract birds. Birds bring color, song, and liveliness in any season, but on gloomy winter days they can be especially cheering.

Evergreens don't just bring deep green to the landscape. They can provide blues, yellows, and many shades of green from olive to chartreuse. Some take on a bronze cast in the winter. Junipers may become tinged with purple.

Color can come from stems and bark as well. Consider red or yellow-twig dogwoods or the coral-bark maple. The bark of the Japanese crepe myrtle (*Lagerstroemia fauriei*) and 'Natchez' crepe myrtle is warm cinnamon.

Winter is a great time to appreciate form and structure – from tree silhouettes to garden paths and overall design. Think of the coarse figure of bare fig tree, the tiered branching pattern of flowering dogwood, the contortions of Harry Lauder's walking stick, or weeping forms of many plants such as 'Lace Parasol' winged elm. Also think

of tall ornamental grasses, not just for their sound and movement, but for their patterns against the sky or against a dark hedge or wall.

Sadly, many people are unaware of how beautiful gardens can be in winter. Visit the State Botanical Garden of Georgia in Athens, Atlanta Botanical Garden, Gibbs Gardens, Masee Lane Gardens in Fort Valley (home to the camellia collection of American Camellia Society), or other gardens in winter to discover the beauty in what most people consider the "off season."

Oh, and another good thing about being in the garden in winter:
NO MOSQUITOES!

-- Arty Schronce

"Arty's Garden" is a feature in the Farmers and Consumers Market Bulletin published by the Georgia Department of Agriculture. It is written by Arty Schronce, the Department's horticultural expert. He also writes a weekly column, "Consumer Qs," that appears in various newspapers and on the department's website.

To read the original article online, visit www.agr.georgia.gov/plant-for-winter-beauty-and-interest.aspx.



Witch hazel (*Hamamelis virginiana*) flowers
Credit: Elke Rohn



How Do Insects Survive the Winter?

Common green darner (*Anax junius*)

Credit: Caleb Slemmons, National Ecological Observatory Network, www.Bugwood.org

Insects are ectothermic, or cold-blooded, meaning they rely on external sources for heat. Lethal freezing occurs when insects are exposed to outside temperatures below the melting point of their bodily fluids. To survive the cold weather of winter, a variety of behavioral and physiological adaptations have evolved in insects. Some insects escape the cold, either through migration or by moving to a more advantageous area in their environment. Many insects have evolved to overwinter in a cold hardy stage of growth. Insects can also increase their cold hardiness by utilizing freeze avoidance or freeze tolerating mechanisms. In temperate regions like Georgia, many insects overwinter in a protective area or more protective life stage.

While some insects will die during the winter, most will survive. Native insects are especially capable of surviving cold weather where they live. Insects are highly adaptable, having been around for over 300 million years, and can survive and thrive in extreme weather conditions. Pretty impressive for creatures that only weigh a few grams or less!



The woolly bear caterpillar (*Pyrrharctia Isabella*) is a freeze tolerant insect. Folklore tells that if a woolly bear caterpillar's brown stripe is thick, the winter weather will be mild. If the brown stripe is narrow, the winter will be severe.
Credit: Whitney Cranshaw, Colorado State University, www.Bugwood.org

Migration

To escape the cold, some insects have evolved to migrate. Unlike bird migration, which consists of a round trip for each individual, insect migrations generally take place over multiple generations due to their short life spans. Perhaps the most famous insect migration is that of the monarch butterfly (*Danaus plexippus*). Each fall, millions of monarchs migrate from as far north as Canada to Mexico. A less well-known insect migration is that of the common green darner dragonfly (*Anax junius*). While much is not known about this migration, green darners leave their northern ranges in September and fly south.

Freeze Avoidance

Freeze avoidant insects avoid freezing by keeping their bodily fluids liquid. This is accomplished through the use of physiological and biochemical adaptations. With both mechanisms, supercooling is the end result. Supercooling is the process by which a liquid or gas cools to below its freezing point without changing phase into a solid due to the lack of a nucleation source. In order for ice to form, a nucleation source such as dust must be present for water to crystalize. Without a nucleation source, the freezing point of water lowers to -42°C.

In insects, physiological adaptations that lower the freezing point of bodily fluids remove nucleation sources. For example, during their initial cold hardiness preparations of the season, insects remove ice nucleating agents such as dust, food particles, and bacteria from their bodies. This is achieved by cessation of feeding, evacuation of the digestive system, or shedding the mid-gut during molting. Insects will also limit their water intake to facilitate supercooling.

In addition to physiological strategies, many freeze avoidant insects avoid freezing by metabolizing cryoprotectants, or antifreeze compounds. Cryoprotectants, such as polyols (sugar alcohols) and sugars, facilitate the supercooling of bodily fluids and tissue. Cryoprotectant compounds include sorbitol, mannitol, ethylene glycol, and glycerol, with glycerol being the most common. Glycerol levels in the insect's body can reach twenty percent of the total body mass and is evenly distributed throughout the head, thorax, and abdomen.

Freeze Tolerance

Freeze tolerant insects can tolerate the formation of ice inside their bodies and avoid tissue damage and death by regulating where, when, and to what extent ice forms. Freeze tolerance is the most cold hardy adaptation and is used in regions with the harshest winters, such as the Arctic. By producing ice nucleating agents in late fall and early winter, they control the formation of ice to the outside of their cells, resulting in safe extracellular freezing. The fluid that surrounds the cells of these insects freezes, forcing the intracellular water to leave the cell through osmosis. With less water inside the cell, the freezing point of the remaining water is lower because a small amount of water has a lower freezing point than a larger amount of water. Freeze tolerant insects also synthesize cryoprotectants inside their cells to regulate osmosis. Glycerol inside the cells attracts water, shifting osmosis and holding enough water inside the cell to reduce dehydration.

Once frozen, insects can be cooled to very low sub-zero temperatures, between -40°C to -80°C , which is much lower than the threshold for freeze avoidance insects. While freeze avoidance is more common, freeze tolerance has been noted in six insect orders: Lepidoptera, Blattodea, Diptera, Orthoptera, Coleoptera, and Hymenoptera. Examples of freeze tolerant insects include the woolly bear (*Pyrrharctia Isabella*), the flightless midge (*Belgica antarctica*), and the alpine cockroach (*Celatoblatta quinquemaculata*).

Stage of Growth

Insects pass through several stages of growth, and most insects have adapted to overwinter in their most freeze tolerant stage. Generally, this is a non-feeding growth stage, such as egg or pupa. Insect eggs are more freeze tolerant because they are small and contain less water. Since pupae do not feed, their gut does not contain ice nucleating agents. As a further defense, pupae are enclosed in structures, such as cocoons or chrysalides, which provide protection from external ice.



Many mosquitos, like the tiger mosquito (*Aedes albopictus*), spend the winter in the egg stage and hatch during the spring, when temperature and water levels are ideal. Credit: Susan Ellis, www.Bugwood.org

Winter Survival of Aquatic Macroinvertebrates

Many insects survive the winter not as adults on land, but as nymphs or larvae in the water. These insects use freeze tolerance techniques similar to terrestrial insects. Aquatic insects typically have supercooling points between -3°C to -7°C . They can also move deeper in the waterbody, seeking warmer temperatures compared to the surface water. Stoneflies, mayflies, caddisflies, and dragonflies are common aquatic overwintering insects.



Northern caddisfly (family Limnephilidae) larva with characteristic case. Credit: Howard Ensign Evans, Colorado State University, www.Bugwood.org

Environment

Insects have also evolved to use their surroundings to their advantage. Some mosquitos take shelter, like inside the envelope of a house or under a bridge. Many insects pupate or hibernate in the soil, protecting them from the most extreme temperatures. This is true of the tomato hornworm (*Manduca quinquemaculata*), which pupates several inches deep in the soil. Others move to a different but nearby habitat, such as from a field to woodland. Snow itself can provide insulation, and insects also burrow in the bark on the south side of trees to take advantage of sunny days.

Resources

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Hibernation

Some mammals hibernate to survive winter. Shorter day lengths, falling temperatures, and a decrease in available food trigger this gradual state of inactivity. To conserve energy and fat reserves, a hibernating animal's heart rate slows down, body temperature lowers (sometimes close to freezing), and metabolism decreases. Depending on the species and the weather, hibernation may last several days or weeks. Examples of hibernating wildlife include bats, groundhogs, and some mice. Although bears retreat to their dens in the winter, they are not considered true hibernators. Bears are easily awakened, unlike the small mammals that go through significant physiological changes and fall into a deep sleep.

*Linda May, Environmental Outreach Coordinator
Georgia DNR Wildlife Resources Division*

OBSERVATIONS



Groundhog (Marmota monax)
Credit: Brett Marshall, Sault College,
www.Bugwood.org

ANNOUNCEMENTS

2015-16 Chattahoochee Challenge Update

Attention watershed stewards! The deadline for the second annual Chattahoochee Challenge has been extended to **January 15, 2016**. Go to www.cobbstreams.org to register now.

The Chattahoochee Challenge is a volunteer competition created by the Watershed Stewardship Program to promote the participation in and organization of waterway related service projects. The group that earns the most volunteer hours by collecting stream data, marking storm drains, pulling privet, and cleaning waterways will receive a free rafting trip (30 person maximum) on the Chattahoochee River with a park ranger from the National Park Service, Chattahoochee River National Recreation Area. Plus, the watershed, and ultimately the Chattahoochee River, will be cleaner and healthier. This contest is a fun and exciting opportunity for individuals, clubs, scouts, families, community organizations, and businesses.

Challenge participants can organize their own service projects or participate in events offered by the Watershed Stewardship Program. We can provide supplies and support to those organizing their own events.

Upcoming Watershed Stewardship Program Volunteer Events

- February 6 • 10am-12pm • Privet Pull
- March 19 • 9:30am-12pm • Stream Cleanup
- April 16 • 9am-12pm • Storm Drain Marking

The locations of these events will be determined closer to each date. Call 770-528-1482 or email water_rsvp@cobbcounty.org to learn more and sign up to attend.

Household Hazardous Waste Amnesty Event Receives Award!

In November, Keep Georgia Beautiful recognized Cobb County's HHW Amnesty Event as part of their 2015 Awards Program. Cobb's event took second place in the Waste Reduction and Recycling category. Organized by the Cobb County Watershed Stewardship Program and Keep Cobb Beautiful, Cobb County's first household hazardous waste amnesty event was held on Saturday, July 25th, 2015. This event was the first free opportunity for the community to properly dispose of hazards, and all HHW materials were accepted. The Cobb County Water System, Keep Cobb Beautiful, and Advanced Disposal provided funding for the event. Perma-Fix of Florida, Inc. handled all materials and disposal.

Save the Date!

2016 Watershed Stewardship Fair

Wednesday, March 23rd
6:30 - 9:00 PM
Cobb County Water Quality Lab
662 South Cobb Drive, Marietta, Georgia 30060

Please join us on Wednesday, March 23rd, 2016 for our annual Watershed Stewardship Fair! This event provides volunteers with the opportunity to showcase their water protection efforts and meet others who share the passion for keeping our waterways healthy.

Participants are encouraged to share their stream observations and project goals with the community, and each group is invited to create a poster displaying their water quality conservation efforts. For those who wish, we give each watershed stewardship group a few minutes to relate success stories and share concerns and frustrations with a like-minded audience. We will also celebrate the accomplishments of our volunteers and partners by presenting several Watershed Stewardship awards. In addition to a fun evening of education and mingling, tours will be conducted for those who are interested in the day-to-day workings of the Cobb County Water Quality Laboratory.

This is your opportunity to learn from and support other Cobb County volunteers! Refreshments will be provided. Please contact us at 770-528-1482 or water_rsvp@cobbcounty.org for more information and to RSVP.

ECOPEDIA

Torpor

Daily torpor is defined as a controlled reduction in body temperature and metabolic rate for less than 24 hours, accompanied by inactivity and absence of locomotion. Most animals go into torpor in the coldest parts of the night, approximately from 3:00am to sunrise. Daily torpor is a widespread phenomenon. It is found in at least eleven mammalian orders including marsupials and in six avian families.

<http://evolutionbiology.com>

RECOMMENDED RESOURCE

Symphony of the Soil

Drawing from ancient knowledge and cutting edge science, (the film) *Symphony of the Soil* is an artistic exploration of the miraculous substance soil. By understanding the elaborate relationships and mutuality between soil, water, the atmosphere, plants, and animals, we come to appreciate the complex and dynamic nature of this precious resource. The film also examines our human relationship with soil, the use and misuse of soil in agriculture, deforestation and development, and the latest scientific research on soil's key role in ameliorating the most challenging environmental issues of our time. Filmed on four continents, featuring esteemed scientists and working farmers and ranchers, *Symphony of the Soil* is an intriguing presentation that highlights possibilities of healthy soil creating healthy plants creating healthy humans living on a healthy planet.

www.symphonyofthesoil.com

CONSERVATION TIP

Valentine's Day

Follow these green Valentine's Day tips and you'll benefit more than just your special someone: you'll be supporting healthy communities and a healthy planet. Now *that's* heartwarming.

Give Eco-Friendly Chocolate. Not only does the Rainforest Alliance certify chocolate that's better for the environment, "shopping the frog" ensures that cocoa farmers have good living and working conditions. The Arbor Day Foundation also sells a line of shade grown organic chocolates.

Buy Local Flowers. If flowers are your style, swing by your local farmers' market for a fresh bouquet of your favorites. It beats buying imported flowers that have often been doused in pesticides.

Ditch Dirty Gold. Did you know that the manufacture of an average gold ring creates more than 20 tons of mining waste? Yikes! Be sure to buy your jewelry from one of the 90 retailers who have committed to ending destructive gold mining through Earthworks: <http://nodirtygold.earthworksonline.org>.

www.earthshare.org



Like us on Facebook! We post twice weekly updates, workshop information, natural history tidbits, and more!



Follow our company page on LinkedIn.



Follow our boards on Pinterest for environmental education and stewardship resources.



Read our Rain & Wildlife Garden Phenology Blog

Stewardship Stars Excellence in Data Collection

The following volunteers have submitted data each month during the September, October, and November quarter:

- Anne Ledbetter** - Chemical & Bacterial Monitoring in the Rottenwood Watershed
- Bishop Lake and Its 6 Inflows** - Chemical & Bacterial Monitoring in the Willeo Watershed
- Butler Creek Kennesaw** - Chemical & Bacterial Monitoring in the Butler Watershed
- Bushart** - Chemical Monitoring in the Sewell Mill Watershed
- Environmental Club of Walton High School** - Chemical Monitoring in the Sope Watershed
- ERM Atlanta** - Chemical Monitoring in the Chattahoochee Watershed
- Keep Smyrna Beautiful Adopt-A-Stream** - Chemical Monitoring in the Nickajack Watershed
- Lassiter High School APES classes** - Chemical & Bacterial Monitoring in the Rubes Watershed
- Pope High School** - Chemical Monitoring in the Sewell Mill Watershed
- Richard's Creek** - Chemical Monitoring in the Allatoona Watershed
- Salty** - Chemical Monitoring in the Sope Watershed
- Sierra Club Cobb Centennial Group** - Chemical, Biological, & Bacterial Monitoring in the Rottenwood Watershed
- Sope Creek Sentry** - Chemical Monitoring in the Sope Watershed
- Village North Highlands Subdivision** - Chemical, Macroinvertebrate, & Bacterial Monitoring in the Willeo Watershed

Thank you for your hard work and dedication!

The Lake

The lake is shimmering like ice.

It is flowing like the grass.

Fish swim as fast as the wind.

The lake has reflections on its surface like a piece of glass.

I see a frog on a water lily.

Leaves are floating by.

The rivers feed lakes like a mother duck feeding her young.

Naya Patel

Grade 2

Casa Montessori, Marietta

Teacher: Cyndia Hunnicutt

2015 Georgia River of Words State Poetry Winner

Photo credit: Paul Ciaca

w e l c o m e

Daydreamers

Chemical & Bacterial Monitoring on Noses Creek

John Keiler

Chemical Monitoring in the Allatoona Watershed

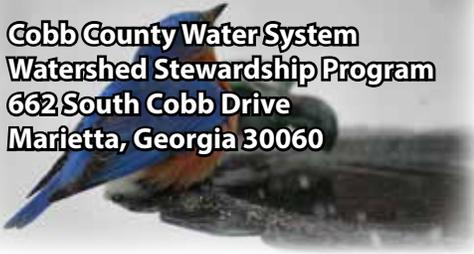
Johnson Family Hampton Lake

Chemical Monitoring in the Willeo Watershed

McClure Middle School

Chemical Monitoring on Butler Creek

**Cobb County Water System
Watershed Stewardship Program
662 South Cobb Drive
Marietta, Georgia 30060**



Cover photo: Eastern Bluebird (*Sialia sialis*)
Credit: Maria Corcas



Cobb County...Expect the Best!

This is an official publication of the Cobb County Water System, an agency of the Cobb County Board of Commissioners.

Calendar of Events

January

- 7 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 14 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 21 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 23 Adopt-A-Stream Macroinvertebrate Monitoring Workshop • 9:00am - 1:00pm • Cobb County Water Quality Laboratory
- 26 Homeschool Winter Science Series • Ecosystems & Adaptations • 10:00am - 12:00pm • Cobb County Water Quality Laboratory
- 28 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory

February

- 4 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 6 Privet Pull on Nickajack Creek • 10:00am - 12:00pm • Heritage Park
- 11 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 12 Homeschool Winter Science Series • Snakes of Cobb County • 10:00am - 12:00pm • Cobb County Water Quality Laboratory
- 25 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 25 Adopt-A-Stream Chemical Monitoring Workshop • 6:30pm - 9:00pm • Cobb County Water Quality Laboratory

March

- 3 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 4-5 Environmental Education Alliance of Georgia Annual Conference • Gwinnett Environmental & Heritage Center • Buford, Georgia • www.eealliance.org
- 11-12 Adopt-A-Stream Confluence • Gwinnett Environmental & Heritage Center • Buford, Georgia • www.georgiaadoptastream.org
- 16 Adopt-A-Stream Bacterial Monitoring Workshop • 6:30pm - 9:00pm • Cobb County Water Quality Laboratory
- 17 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 19 Stream Cleanup • Location TBD • 9:30am - 12:00pm
- 23 Watershed Stewardship Fair • 6:30pm - 9:00pm • Cobb County Water Quality Laboratory
- 24 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory
- 31 Garden Work Day • 9:00am - 11:00am • Cobb County Water Quality Laboratory

Events in **BLUE** are Cobb County Watershed Stewardship events.
More information can be found on our Calendar at www.cobbstreams.org.