

# the Thalweg

Fall 2011

Watershed Stewardship Program

Volume 8 Issue 4

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## *Pick It Up Pals Program*

Every time it rains, water runs off roof tops, lawns, driveways, parking lots, and streets picking up pollutants and debris along the way. Eventually, "stormwater" flows into rivers, lakes, or streams, carrying pollutants with it. This impacts the water for both aquatic life and human use.

Stormwater pollution is one of the biggest problems facing the water resources of metropolitan north Georgia. In fact, the majority of the water quality violations in the region are due to polluted stormwater runoff.

As of 2011, there are over 75 million pet dogs in the United States. Bacteria and other pathogens in pet waste left on yards, sidewalks, streets, and other opened areas can be washed away and carried by rainwater into the storm drains and drainage ditches which flow to nearby rivers, lakes, and streams.

- A single gram of pet waste contains an average of 23 million fecal coliform bacteria, some of which can cause disease in humans.
- Waters that contain high levels of bacteria are unfit for human contact.
- As animal waste decays, it uses up dissolved oxygen that fish and aquatic life need.
- Pet waste contains nutrients that can cause excessive algae growth in a river or lake, disturbing the natural balance.

High bacteria levels have been documented in some surface waters in Cobb County resulting in several stream segments being listed on Georgia's 303(d) impaired waters list. Cobb County Water's *Pick It Up* Program has partnered with Cobb County Parks, Recreational and Cultural Affairs to install *Pick It Up* pet waste disposal stations along our trails and in local parks. The main goal of *Pick It Up* is to reduce bacteria levels in our surface water, thereby improving water quality, by reducing pet waste in public areas. We hope for additional water quality improvement as citizens adopt a *Pick It Up* practice on their private property.

Picking up after your pet keeps contamination out of nearby storm drains, drainage ditches, streams, and lakes. It helps keep waters healthy and animals depend on clean water.

*Pick It Up* has expanded into a *Pals* program that recognizes local canines with owners that are "doing their doodie." We encourage Cobb residents to sign the **Pick It Up Pal Pledge** and receive a free pet waste bag dispenser.

#### **Pick it Up Pal Pledge**

We, pet and pet owner, pledge to keep our river, streams, and lakes healthy by:

- Promptly picking up pet waste
- Disposing of pet waste in a garbage can
- Remaining on leash in public
- Staying on trails
- Avoiding contact with wildlife

For more information and to sign the pledge please visit:  
[www.cobbstreams.org](http://www.cobbstreams.org)



# Why Leaves Change Color?

*Article by the USDA Forest Service*

If you are lucky, you live in one of those parts of the world where Nature has one last fling before settling down into winter's sleep. In those lucky places, as days shorten and temperatures become crisp, the quiet green palette of summer foliage is transformed into the vivid autumn palette of reds, oranges, golds, and browns before the leaves fall off the trees. On special years, the colors are truly breathtaking.

## How does autumn color happen?

For years, scientists have worked to understand the changes that happen to trees and shrubs in the autumn. Although we don't know all the details, we do know enough to explain the basics and help you to enjoy more fully Nature's multicolored autumn farewell. Three factors influence autumn leaf color—leaf pigments, length of night, and weather, but not quite in the way we think. The timing of color change and leaf fall are primarily regulated by the calendar, that is, the increasing length of night. None of the other environmental influences—temperature, rainfall, food supply, and so on—are as unvarying as the steadily increasing length of night during autumn. As days grow shorter, and nights grow longer and cooler, biochemical processes in the leaf begin to paint the landscape with Nature's autumn palette.

## Where do autumn colors come from?

A color palette needs pigments, and there are three types that are involved in autumn color.

- Chlorophyll, which gives leaves their basic green color. It is necessary for photosynthesis, the chemical reaction that enables plants to use sunlight to manufacture sugars for their food. Trees in the temperate zones store these sugars for their winter dormant period.
- Carotenoids, which produce yellow, orange, and brown colors in such things as corn, carrots, and daffodils, as well as rutabagas, buttercups, and bananas.
- Anthocyanins, which give color to such familiar things as cranberries, red apples, concord grapes, blueberries, cherries, strawberries, and plums. They are water soluble and appear in the watery liquid of leaf cells.

Both chlorophyll and carotenoids are present in the chloroplasts of leaf cells throughout the growing season. Most anthocyanins are produced in the autumn, in response to bright light and excess plant sugars within leaf cells.

During the growing season, chlorophyll is continually being produced and broken down and leaves appear green. As night length increases in the autumn, chlorophyll production slows down and then stops and eventually all the chlorophyll is destroyed. The carotenoids and anthocyanins that are present in the leaf are then unmasked and show their colors.



Certain colors are characteristic of particular species. Oaks turn red, brown, or russet; hickories, golden bronze; aspen and yellow-poplar, golden yellow; dogwood, purplish red; beech, light tan; and sourwood and black tupelo, crimson. Maples differ species by species—red maple turns brilliant scarlet; sugar maple, orange-red; and black maple, glowing yellow. Striped maple becomes almost colorless. Leaves of some species such as the elms simply shrivel up and fall, exhibiting little color other than drab brown.



The timing of the color change also varies by species. Sourwood in southern forests can become vividly colorful in late summer while all other species are still vigorously green. Oaks put on their colors long after other species have already shed their leaves. These differences in timing among species seem to be genetically inherited, for a particular species at the same latitude will show the same coloration in the cool temperatures of high mountain elevations at about the same time as it does in warmer lowlands.

## How does weather affect autumn color?

The amount and brilliance of the colors that develop in any particular autumn season are related to weather conditions that occur before and during the time the chlorophyll in the leaves is dwindling. Temperature and moisture are the main influences.

A succession of warm, sunny days and cool, crisp but not freezing nights seems to bring about the most spectacular color displays. During these days, lots of sugars

are produced in the leaf but the cool nights and the gradual closing of veins going into the leaf prevent these sugars from moving out. These conditions—lots of sugar and lots of light—spur production of the brilliant anthocyanin pigments, which tint reds, purples, and crimson. Because carotenoids are always present in leaves, the yellow and gold colors remain fairly constant from year to year.

The amount of moisture in the soil also affects autumn colors. Like the weather, soil moisture varies greatly from year to year. The



countless combinations of these two highly variable factors assure that no two autumns can be exactly alike. A late spring, or a severe summer drought, can delay the onset of fall color by a few weeks. A warm period during fall will also lower the intensity of autumn colors. A warm wet spring, favorable summer weather, and warm sunny fall days with cool nights should produce the most brilliant autumn colors.

#### What triggers leaf fall?

In early autumn, in response to the shortening days and declining intensity of sunlight, leaves begin the processes leading up to their fall. The veins that carry fluids into and out of the leaf gradually close off as a layer of cells forms at the base of each leaf. These clogged veins trap sugars in the leaf and promote production of anthocyanins. Once this separation layer is complete and the connecting tissues are sealed off, the leaf is ready to fall.

#### What does all this do for the tree?

Winter is a certainty that all vegetation in the temperate zones must face each year. Perennial plants, including trees, must have some sort of protection to survive freezing temperatures and other harsh wintertime influences. Stems, twigs, and buds are equipped to survive extreme cold so that they can reawaken when spring heralds the start of another growing season. Tender leaf tissues, however, would freeze in winter, so plants must either toughen up and protect their leaves or dispose of them.

The evergreens-pines, spruces, cedars, firs, and so on-are able to survive winter because they have toughened up. Their needle-like or scale-like foliage is covered with a heavy wax coating and the fluid inside their cells contains substances that resist freezing. Thus the foliage of evergreens can safely withstand all but the severest winter conditions, such as those in the Arctic. Evergreen needles survive for some years but eventually fall because of old age.

The leaves of broadleaved plants, on the other hand, are tender and vulnerable to damage. These leaves are typically broad and thin and are not protected by any thick coverings. The fluid in cells of these leaves is usually a thin, watery sap that freezes readily. This means that the cells could not survive winter where temperatures fall below freezing. Tissues unable to overwinter must be sealed off and shed to ensure the plant's continued survival. Thus leaf fall precedes each winter in the temperate zones.

#### What happens to all those fallen leaves?

Needles and leaves that fall are not wasted. They decompose and restock the soil with nutrients and make up part of the spongy humus layer of the forest floor that absorbs and holds rainfall. Fallen leaves also become food for numerous soil organisms vital to the forest ecosystem.

It is quite easy to see the benefit to the tree of its annual leaf fall, but the advantage to the entire forest is more subtle. It could well be that the forest could no more survive without its annual replenishment from leaves than the individual tree could survive without shedding these leaves. The many beautiful interrelationships in the forest community leave us with myriad fascinating puzzles still to solve.



photo credit: Joe Nicholson, Nature Photographer, Bugwood.org

#### Where can I see autumn color in the United States?

You can find autumn color in parks and woodlands, in the cities, countryside, and mountains - anywhere you find deciduous broadleaved trees, the ones that drop their leaves in the autumn. Nature's autumn palette is painted on oaks, maples, beeches, sweetgums, yellow-poplars, dogwoods, hickories, and others. Your own neighborhood may be planted with special trees that were selected for their autumn color.

New England is rightly famous for the spectacular autumn colors painted on the trees of its mountains and countryside, but the Adirondack, Appalachian, Smoky, and Rocky Mountains are also clad with colorful displays. In the East, we can see the reds, oranges, golds, and bronzes of the mixed deciduous woodlands; in the West, we see the bright yellows of aspen stands and larches contrasting with the dark greens of the evergreen conifers.

Many of the Forest Service's 100 plus scenic byways were planned with autumn color in mind. In 31 States you can drive on over 3,000 miles of scenic byways, and almost everyone of them offers a beautiful, colorful drive sometime in the autumn.

#### When is the best time to see autumn color?

Unfortunately, autumn color is not very predictable, especially in the long term. Half the fun is trying to outguess Nature! But it generally starts in late September in New England and moves southward, reaching the Smoky Mountains by early November. It also appears about this time in the high-elevation mountains of the West.



Remember that cooler high elevations will color up before the valleys. The Forest Service's Fall Color Hotline (1-800-354-4595) can provide you with details as the autumn color display progresses.

#### Reference

<http://www.na.fs.fed.us/fhp/pubs/leaves/leaves.shtml>

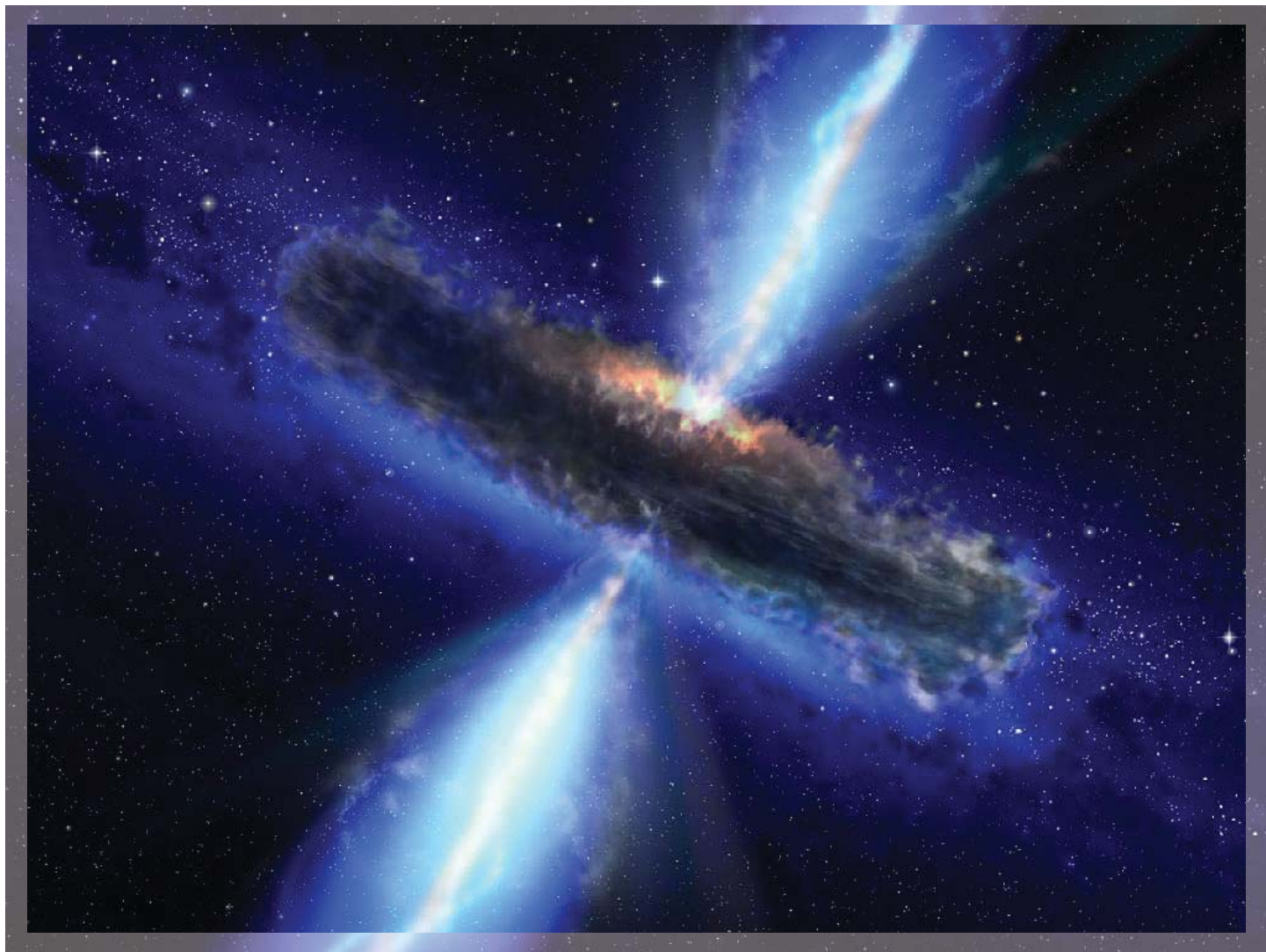


Photo caption: This artist's concept illustrates a quasar, or feeding black hole, similar to APM 08279+5255, where astronomers discovered huge amounts of water vapor. Gas and dust likely form a torus around the central black hole, with clouds of charged gas above and below.

CREDIT: NASA/ESA

## Astronomers Find Largest, Oldest Mass of Water in Universe

Astronomers have discovered the largest and oldest mass of water ever detected in the universe — a gigantic, 12-billion-year-old cloud harboring 140 trillion times more water than all of Earth's oceans combined.

The cloud of water vapor surrounds a supermassive black hole called a quasar located 12 billion light-years from Earth. The discovery shows that water has been prevalent in the universe for nearly its entire existence, researchers said.

"Because the light we are seeing left this quasar more than 12 billion years ago, we are seeing water that was present only some 1.6 billion years after the beginning of the universe," said study co-author Alberto Bolatto, of the University of Maryland, in a statement. "This discovery pushes the detection of water one billion years closer to the Big Bang than any previous find."



### Studying a distant quasar

Quasars are the most luminous, most powerful and most energetic objects in the universe. They are powered by enormous black holes that suck in surrounding gas and dust and spew out huge amounts of energy.

The research team studied a particular quasar called APM 08279+5255, which harbors a black hole 20 billion times more massive than the sun and produces as much energy as one quadrillion suns.

The astronomers used two different telescopes, one in Hawaii and one in California, to detect and confirm the water vapor surrounding the quasar. Scientists think water vapor was present even in the early universe. So finding this old cloud of the stuff doesn't come as a shock.

"It's another demonstration that water is pervasive throughout the universe, even at the very earliest times," said study lead author Matt Bradford of NASA's Jet Propulsion Laboratory in Pasadena, Calif.

However, the sheer size of the vapor cloud may surprise some scientists. APM 08279+5255 contains 4,000 times more water vapor than our own Milky Way galaxy, researchers said. That may be because much of the Milky Way's water is locked up in ice rather than vapor.

### Learning about the quasar

The water vapor in the quasar is distributed around the massive black hole in a region spanning hundreds of light-years. The cloud has a temperature of minus 63 degrees Fahrenheit (minus 53 degrees Celsius), and it's 300 trillion times less dense than Earth's atmosphere.

That may sound chilly and tenuous, but it means the cloud is five times hotter and 10 to 100 times denser than what's typical in galaxies like the Milky Way, researchers said.

In addition to shedding light on the early universe, the huge vapor cloud also reveals some important information about the quasar, researchers said.

Measurements of the water vapor and of other molecules, such as carbon monoxide, suggest that there is enough gas to feed the black hole until it grows to about six times its size. Whether or not this will happen is unclear, researchers said, since some of the gas may end up condensing into stars or may be ejected from the quasar.

The study has been accepted for publication in the Astrophysical Journal Letters.

### Reference

<http://www.space.com/12400-universe-biggest-oldest-cloud-water.html>

*...water is pervasive  
throughout the  
universe...*

## OBSERVATIONS



Many species of birds leave Georgia in the fall to fly south for the winter, and we will miss their pretty colors and songs until they return in the spring. However, other birds from northern states are arriving in Georgia right now! Keep your eyes peeled and binoculars ready to see different species of waterfowl, hawks, and songbirds moving in this time of year. The Dark-Eyed Junco, a dark gray sparrow with a pale pink beak, is common at ground-level birdfeeders in cooler months. Some people refer to juncos as "snowbirds" since they only stay here in the fall and winter.

Linda May  
Environmental Outreach Coordinator  
Georgia DNR, Wildlife Resources Division

### STUDENT SUBMISSION

## *Life Begins In Water*



Sarah Hamby  
Kennesaw State University  
Professor: Jason Snape



## welcome

**Dodgen Middle School** will be monitoring  
in the Sewell Mill Creek Watershed

**Addison Elementary School** will be monitoring  
in the Rubes Creek Watershed

**Murdock Elementary School** will be monitoring  
Sewell Mill Creek

**Russell Elementary School** will be monitoring  
Mill Creek Lake

**Vaughan Elementary School** will be monitoring  
in the Etowah Watershed

**Hillgrove High School** will be monitoring  
in the Noses Creek Watershed

**Lassiter High School** will be monitoring  
Rubes Creek

**Watkins Waterworks** will be monitoring  
Nickajack Creek.

**SG5** will be monitoring Nickajack Creek

**Water Guardians** will be monitoring  
Popular Creek

## RECOMMENDED RESOURCE

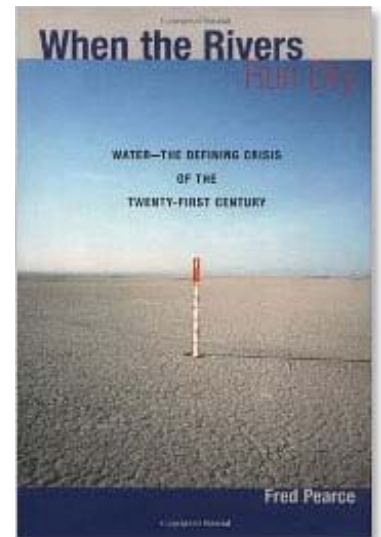
**When the Rivers Run Dry** by Fred Pearce

*Reviewed by Beacon Press*

Throughout history, rivers have been our foremost source of fresh water both for agriculture and for individual consumption, but now economists say that by 2025 water scarcity will cut global food production by more than the current U.S. grain harvest. In this groundbreaking book, veteran science correspondent Fred Pearce focuses on the dire state of the world's rivers to provide our most complete portrait yet of the growing world water crisis and its ramifications for us all.

Pearce traveled to more than thirty countries while researching *When the Rivers Run Dry*, examining the current state of crucial water sources like the Indus River in Pakistan, the Colorado River in the United States, and the Yellow and Yangtze rivers in China. Pearce deftly weaves together the complicated scientific, economic, and historic dimensions of the water crisis, showing us its complex origins—from waste to wrong-headed engineering projects to high-yield crop varieties that have saved developing countries from starvation but are now emptying their water reserves. He reveals the most daunting water issues we face today, among them the threat of flooding in China's Yellow River, where rising silt levels will prevent dykes from containing floodwaters; the impoverishment of Pakistan's Sindh, a once-fertile farming valley now destroyed by the 14 million tons of salt that the much-depleted Indus deposits annually on the land but cannot remove; the disappearing Colorado River, whose reservoirs were once the lifeblood of seven states but which could dry up as soon as 2007; and the poisoned springs of Palestine and the Jordan River, where Israeli control of the water supply has only fed conflict between Israelis and Palestinians.

The situation is dire, but not without remedy. Pearce argues that the solution to the growing worldwide water shortage is not more and bigger dams but greater efficiency and a new water ethic based on managing the water cycle for maximum social benefit rather than narrow self-interest.



## ANNOUNCEMENTS

### WELCOME to HOPE STEWART & SARAH HALL

Hope and Sarah joined our team in September as seasonal program assistants. They will be presenting our water quality puppet show, Brooke and Branch, to 3rd graders at local schools this year.



**Hope** has earned a Bachelor of Science in Conservation Biology from Clemson University. She previously worked as an educator at Zoo Atlanta and volunteered for the Chattahoochee Nature Center where she learned to handle wildlife. She was also a production assistant on an award winning nature series called *Expeditions*.

**Sarah** has earned a Bachelor of Science in Marine Biology and Aquaculture from Florida Institute of Technology and a Master of Natural Resources in Fisheries from UGA. She previously worked with Athens-Clark County helping develop their water conservation education program and volunteered as a trail guide at Sandy Creek Nature Center.







## REMINDER

### Volunteers Needed in the Rain Garden

Do you like working in a garden and learning about different flora and fauna? Want to learn more about gardening? Join Cobb County Master Gardeners and the Watershed Stewardship Program staff, on Wednesday mornings through the fall, in the rain and wildlife garden at the Cobb County Water Quality Laboratory in Marietta.

The site was developed for education purposes, specifically to demonstrate bioretention techniques for both residential and commercial settings with plantings installed to provide habitat for pollinators and urban wildlife. Many native species and specific butterfly host and nectar plants showcase how-to attract animals to your landscape. Two types of rain gardens have been installed, creating a focal point in the landscape that attracts pollinators and other wildlife while improving water quality.

Rain gardens work by capturing run-off from your roof or driveway and diverting it to gardens and low-lying areas to slowly soak into the soil.

Why are rain gardens important? Rainwater that goes into storm drains discharges directly into rivers, lakes or streams. This sudden introduction of large volumes of stormwater erodes stream banks and stream beds and increases flooding risks. Rain gardens protect local waterways by decreasing the volume of runoff entering surface waters during rain events.

Rain gardens provide a unique landscape feature. The plants in the rain garden are both beautiful and helpful. They add color and interest to your landscape. Depending on the type of vegetation you choose to install, the rain garden can also serve as habitat for butterflies, birds and other wildlife.

Not only is the rain garden aesthetically pleasing, but it also serves as a teaching classroom for school groups, scout groups, and other community activities. We hope to see you in the garden!

**Environment** - We usually think of the environment as everything that surrounds us: sky, sea, mountains, forests, rivers, birds, animals. Whether shocked at the destruction of nature or inspired by visions of a healthier world, increasing numbers of people feel a sense of responsibility for taking care of the environment. Environmental organizations, which have grown out of the CONSERVATION movement, deploy organizers, scientists, lawyers, and writers to propose changes in public or industry policies that would lessen our impacts on the environment or make it more habitable for us. Since protecting the purity of the air we breathe, reducing contamination of the water we drink, halting the destruction of the protective ozone layer, or reducing global warming all cost money or affect corporate plans, huge political struggles result.

ECOLOGY, the study of relationships among organisms and between organisms and their surroundings, lets us see the interconnections and processes that really make up "the environment" and gives us a more fundamental reason to protect it. When we eat an apple, we're taking a part of the environment and putting it inside our bodies for a brief period. The apple came from a tree that gathered the richness of sun and SOIL and rain and air. After we digest the apple, extracting the nutrients our bodies can use, our wastes become the food of MICROBES in sewer plants or marshes, thus along with the apple core if we compost it, microbes and their wastes reenter the cycle of plant growth. When we breathe, we take in oxygen that photosynthetic plants and microbes have produced and breathe out carbon dioxide, essential to these plants and microbes. While we are alive, we make use of material resources from the environment. We may think we throw garbage and trash "away," but they go around again and again. We *are* the environment, and it is us.

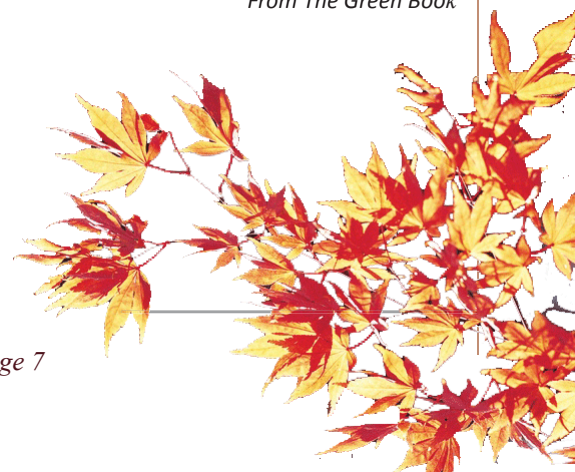
*From Ecology: A Pocket Guide*

## CONSERVATION TIP

### Water Bottles

Use and refill a single water bottle, thermos, or canteen when you travel. The average person in the United States drinks eight ounces of bottled water per day. Considering that plastic is derived from petroleum, it takes 1.5 billion barrels of oil annually to satisfy America's demand for bottled water. If this oil were converted to gasoline, the total could fuel five hundred station wagons to take their families on coast-to-coast road trips.

*From The Green Book*



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



*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

### October

- 5 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 5 Adopt-A-Stream Chemical Monitoring Workshop • 6pm - 8:30pm • Cobb County Water Quality Laboratory
- 7-8 Monarchs In The Classroom Educator Workshop • 5:30pm - 8:30pm, 9: 00am - 4:00pm • Stone Mountain Park
- 12 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 15 Rivers Alive Cleanup • 9am - 1pm • Rottenwood Creek at Life University
- 19 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 21 Outdoor Learning Symposium • 8:30am - 4:30pm • Georgia Perimeter College: Decatur Campus
- 25 Rain Barrel Make & Take Workshop • 3pm - 4pm • Cobb County Water Quality Laboratory
- 26 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 27 Adopt-A-Stream Bacteria Monitoring Workshop • 6pm - 8:30pm • Cobb County Water Quality Laboratory

### November

- 2 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 3 Rain Barrel Make & Take Workshop • 10am - 11am • Cobb County Water Quality Laboratory
- 5 Adopt-A-Stream Biological Workshop • 10am - 3pm • Cobb County Water Quality Laboratory
- 9 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 16 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 30 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory

### December

- 2 Rain Barrel Make & Take Workshop • 10am - 11am • Cobb County Water Quality Laboratory
- 7 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory
- 14 Garden Work Day • 9am - 11am • Cobb County Water Quality Laboratory

Events in red are Cobb County Watershed Stewardship events.  
More information can be found on our Calendar at [www.cobbstreams.org](http://www.cobbstreams.org).