CAYUGA LAKE WATERSHED
Network News
spring 2007

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Trees at Work

By Sharon Anderson, Watershed Steward

Whether growing on a residential street or along a forested stream corridor, trees play a role in reducing flooding. Trees intercept rainfall, slowing the rate at which droplets hits the ground, which gives rainwater a greater chance to soak into the soil, rather than flowing overland. Tree roots create deep passageways that allow water to infiltrate into the soil and trees soak up large amounts of water – as well as nutrients and other pollutants. Added together, trees provide services that significantly decrease the amount and rate of floodwaters reaching the creeks and lake. When it can cost $100,000 or more to design and construct a single stormwater detention pond in an already developed area, using alternatives such as trees can provide cost savings.

Credit: Holly Payne

The benefits from trees last long after the storm. Rain that soaks into the ground recharges groundwater to keep soils moist for crops, to prevent water wells from going dry and to keep streams flowing between rain storms (see "Floods Are An Act of Nature: True or False," page 2). Strategically preserving or planting trees can also slow erosion and lower water temperatures. Increased temperatures can increase nuisance algae populations and rob fish of needed oxygen. Dead wood that falls into a stream provides fish with resting and hiding places and traps sediment and phosphorus reducing the amount that travels to the lake.

The benefits don't stop there. Studies indicate that the presence of trees can create stronger neighborhood ties, reduce crime, and increase the market value of a home up to 15 percent. Trees improve air quality by filtering out toxins and airborne impurities such as sulfur dioxide, ozone and nitrogen, as well as trace toxic metals, including cadmium, nickel, chromium and lead. ·Urban trees can cut street-level, airborne soot up to 60 percent. Well-positioned trees reduce noise pollution and screen unsightly views.

The value of trees is summed up nicely in words of Rebecca Hanmer, director of

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WATERSHED STEWARD'S MESSAGE

Too often people think floods are an act of nature that cannot be altered short of building a dam or other engineering feat. Though these have their place, there are simpler ways human can reduce the severity of flooding. The suite of articles included here will show how planting trees, capturing runoff from parking lots and managing roadside ditches differently can add up to keeping water levels down.

If you want to know more about some of the concepts mentioned, like groundwater recharge, refer back to the exploration of groundwater found in the Winter '07 issue of *Network News.* You can always find back issues by selecting the newsletter link on our home page, www.cayugalake.org.

This and the prior issue of *Network News* have focused on helping you learn how the world of water works. When I think of the job of the Watershed Network, I know helping people learn is not enough and therefore enjoying the natural world will be the focus of the summer edition of *Network News.* As Baba Dioum so eloquently said, "For in the end, we will conserve only what we love. We will love only what we understand. We will understand only what we are taught."

Sharon Anderson

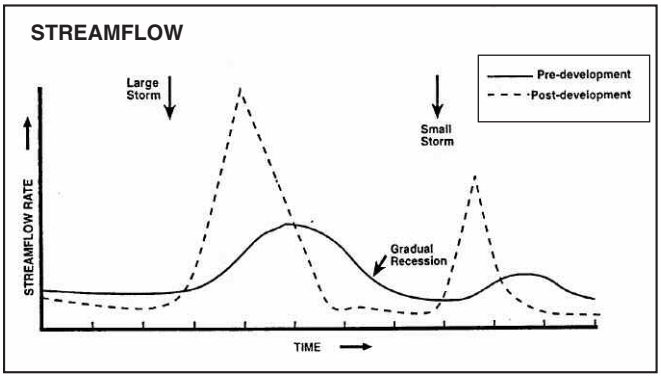
Floods Are an Act of Nature: True or False?

By Sharon Anderson, Watershed Steward

It's true that we can't control the weather, but blaming floods entirely on nature isn't fair either. Humans contribute to flooding by changing the landscape. Paved parking lots, traditional roofing materials, tree removal and filling of wetlands, all have dramatic affects on floodwater damage and frequency.

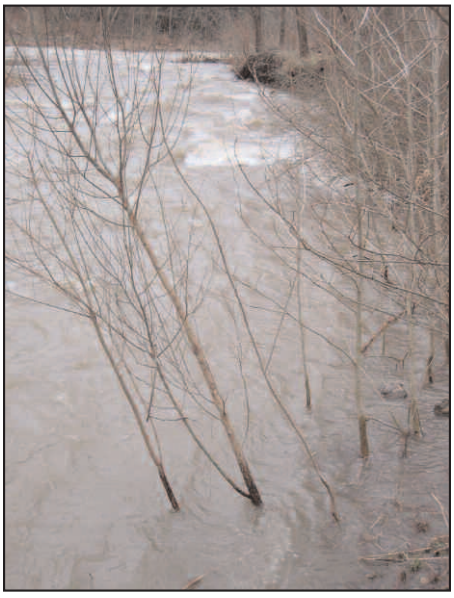
The diagram represents how the water level in a creek rises during a large and small storm. The solid line represents the amount of water flow before there is much development in a watershed. Note how the water flow gradually rises then gradually drops. Between the two storm events, there is plenty of water in the creek.

After there is development, the flow pattern changes in potentially devastating ways, as shown by the dotted line. With the same amount of rain, the water flow increases sooner. It also peaks much higher because stormwater is making its way rapidly to the creek as it runs off roofs, roads and driveways. Floods can happen more quickly and be much more severe.



Water levels rise more dramatically as there is more development.

The impervious cover robs the soil of water that replenishes the creek between storms. When water percolates down through the soil, it recharges the groundwater. Water levels in creeks drop unusually low between storms without this recharge.



Heavy rains naturally result in high water. Keep buildings, water lines and septic systems away from stream banks and the lakeshore.

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Four Years of Success Managing Stormwater Onsite at the Sciencenter

By Charlie Trautmann, Executive Director, Sciencenter

The Sciencenter completed an onsite stormwater treatment system in 2003 that handles the first flush (12 mm) of runoff from our 75-car main parking lot and roof. Together, these areas consist of 2,100 sq meters.

The goal of the project was to reduce the amount of sediment entering Cayuga Lake from our parking lot and roof while also demonstrating how simple and inexpensive it is to design and construct an onsite stormwater treatment system.

Ironically, the project came very close to never happening. When the Sciencenter began to plan a major expansion in the late 1990s, I attended an annual breakfast meeting of Tompkins County Area Development and heard a keynote address about the New York State Environmental Bond Act by an administrator from Albany. During the talk, the speaker mentioned that funds were still available for projects such as this. After the meeting, I buttonholed the speaker. It's a good thing I didn't wait. After years of accepting proposals, the next day turned out to be the last day to apply.

Our proposal went in, and then we waited. One year. Two years. Still no word from Albany. We had put off building the parking lot and doing much of the final site work hoping that the $48,000 grant might somehow come through. And then finally, just days before the 2002 election, we received word that our grant would be approved.

Here's how the system works: We constructed a 1.5-m-deep infiltration basin in the middle of our parking lot, lined it with filter fabric, and filled it in with coarse crushed gravel. This basin is large enough to hold the first 20 mm of rainfall, slowly releasing it to the surrounding soil over time after a storm. An overflow pipe runs out to Cascadilla Creek in case of a large storm, but this pipe only rarely has any water in it.

The basin itself is hardly visible. It extends under the parking lot, and most of it is paved over, with only the middle section visible in the center of our parking lot. The parking lot was graded like a giant wok, so that all the runoff flows into the central gravel area. Additional filter fabric traps sediment before the water drops down into the basin, so any water that does overflow to Cascadilla Creek is relatively free of sediment.

Four years and working well: The system has been trouble-free since its completion in 2003. The sediment traps have been doing their job, and the system releases water to the surrounding soil as designed. Maintenance is limited to periodic checks of the strips of filter fabric to ensure that they are not loaded with sediment. So far, we have not had to replace them. When we do need to replace the filters, we will purchase a roll of fabric from a local garden supply store and replaced the two existing strips.

Credit: Sciencenter

The four cones mark the corners of the underground infiltration basin.

Overall, we have been pleased with the performance of the system and can recommend this type of onsite wastewater treatment for any new parking lot project, as long as the upper soil is reasonably free draining. The extra cost of adding this type of system added only a few percent to the total cost of the parking lot over the cost of a traditional system using storm drains, manholes, and buried piping.

Fifty-year Floods Could Return in Less Than Fifty Years

People talk about 5-year, 10-year and 50-year floods. These terms describe the probability of a flood happening. Based on historical information, a 10-year flood has a 10 percent likelihood of occurring in a given year. This is easily illustrated with a deck of playing cards with two of the kings removed to make a 50-card deck. The chance of picking the Ace of spades from this deck is 1 in 50. If you put the card back in the deck and reshuffle, the chances of picking the Ace of spades is still 1 in 50, just like the chances of getting a 50-year storm in a given year. (adapted from David P. Orr, Roadway and Roadside Drainage by Cornell Local Roads Program).

Coping with Flooded Septic Systems

With snow melt and spring rains, every small stream, gully, culvert, low lying piece of ground and shoreline property can flood, and septic systems can be underwater.

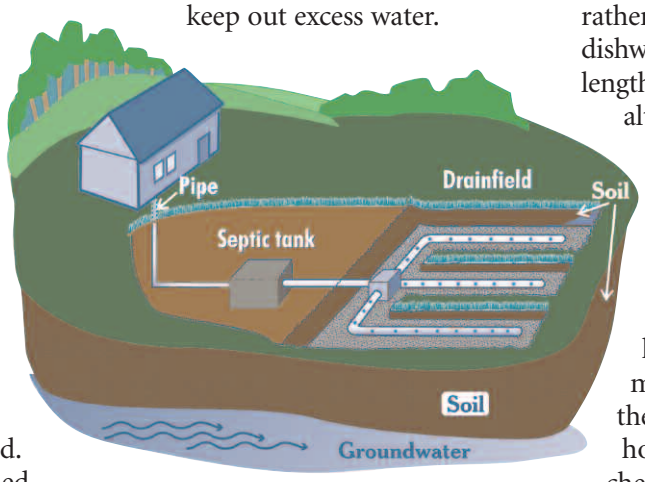
Drainfields Need to Breath.
Where site conditions are suitable, a septic system is a simple, effective, low-cost solution for treating household wastewater. These systems have two main components, a septic tank and drainfield. The treatment process begins in the septic tank that traps the solids and a scum layer of grease and oils. The drainfield receives the septic tank effluent and distributes it below ground into the soil for further treatment. Proper performance relies on the soil's ability to accept and disperse wastewater.

As the wastewater disperses, it is treated by the soil's natural filtering capacity and the action of soil microbes. Under normal conditions, this soil has air in the pore spaces between soil particles. These unsaturated conditions are needed to properly remove pathogens and other contaminants. During flood conditions, the drainfield's ability to handle household water becomes seriously limited. Saturated soil lacks the oxygen needed for the beneficial microbes that are the workhorses of the drain field. In addition, during waterlogged conditions, wastewater from the household plumbing has nowhere to drain to and wastewater can back up into the house. Other signs of failure include sluggish drains and toilets that sound strange when flushed.

When the drainfield is saturated and there is inadequate treatment, contaminated wastewater can enter ground and surface waters. If these waste-contaminated waters inundate a nearby drinking water well, they render it unsafe to drink. Use an alternative drinking water source until the well can be tested and disinfected.

Before the Storm
A well-maintained septic system is better able to withstand the stress of heavy rains or flooding. Regularly have the tank pumped and keep the whole system in good working order at all times by routinely following these three tips: Don't use a garbage disposal to dispose of food waste. Direct all roof gutters away from the drainfield. Send basement sump pump water away from the septic system.

When forewarned of impending flooding, take a few extra steps. If possible, seal any access points to the septic tanks such as the manhole cover and other openings used for inspection or pumpout in order to keep out excess water.



During a storm the groundwater can rise and inundate the drainfield.

If your wastewater system includes a pump, turn off the electricity to the pump at the circuit box before the flood. Waterproof all electrical connections to avoid electrical shock or damage to electrical components. Avoid contact with any electrical devices that are part of the system until the storm has passed and they are dry and clean. Remember to turn the pump back on before you use the system again. Check with a professional to learn what additional care is required for your system. For example, you may be advised to temporarily remove the pump to prevent damage from sediment.

During A Major Storm
While the storm is in process, eliminate all non-essential water use and flush toilets as little as possible. If the drainfield becomes covered with water, do not use the system at all and avoid contact with any standing water that may be contaminated with sewage.

After the Flood
It may be several weeks after the storm before the water has receded and the drainfield dries out. Until then if possible, avoid using the system. At a minimum, reduce water use as much as possible. Wash clothes at a laundromat rather than at home. Don't use the dishwasher. Reduce the number and length of showers or shower at an alternative place such as the gym.

Have your onsite wastewater system professionally inspected and serviced if you suspect damage. This is especially important if you have a non-conventional system that has filters that can clog with mud brought in by floodwaters. If the septic system backs up into the house, have the outlet of the tank checked for blockage. The floating scum layer of fats and grease in the septic tank may lift up and block the outlet tee.

While the soil is still saturated, do not have the septic tank pumped. Pumping it out could cause the tank to float out of the ground, damaging the inlet and outlet pipes. The tank is not really the problem; it's the saturated soil around the drainfield. Even if you do not disturb a recently installed tank, it may pop out of saturated ground if the soil has not had time to settle and compact around it

With a little common sense, you and your septic system should weather the storm. As the floodwater recedes, the system should drain and begin to function properly as adverse conditions correct themselves.

Adapted from "First Aid for a Flooded Septic System," *National Environmental Services Center, 800-624-8301.*

Seeking the Source: How Much Pollution Comes to the Lake Via the Tributaries

By Roxanna Johnston, Watershed Coordinator, City of Ithaca

Steve Turcsik and Brendan Kearns use a devise called a hydrolab to sample lake water.

We know that sediment and phosphorus are key problems for Cayuga Lake but we don't know enough about how much is coming from what sources. In order to learn more, the City of Ithaca started a lake-wide monitoring program in 2004 with the main goal of measuring phosphorus and sediment loading from streams. The initial effort included one lake site and seven stream sites — Cayuga Inlet, Taughannock Creek, Fall Creek, Salmon Creek, Yawger Creek, and the Cayuga-Seneca Canal inlet and outlet. The lake was sampled off Frontenac Point.

That sampling yielded some interesting information about the local streams. Yawger Creek had unexpectedly high conductivity levels, but only in the northern branch. Conductivity measures the capacity of water to conduct electrical current and it gives an indication of the minerals dissolved in the water. Salmon Creek had high levels of nitrate, phosphorus (both total and bio-available) and sediment. Southern streams, in general, contributed more sediment and phosphorus than northern streams. The lake sampling point had a low concentration of all contaminants.

While this is interesting information on the streams, and good news regarding lake water quality, it did not address the main question of how much sediment and phosphorus the streams were contributing to the lake. The sampling program was redesigned to include information on stream flow to quantify the loading of these contaminants.

In 2006, the City of Ithaca secured funding from the US Environmental Protection Agency to augment the US Geological Survey stream gage that measures the flow of water on the Cayuga-Seneca Canal and to install a new gage to measure water flow in Salmon Creek. Flow gages already exist on Fall Creek, on the Cayuga Inlet and at two locations on Six Mile Creek. The Six Mile Creek gages, like the Cayuga-Seneca Canal and Salmon Creek gages, include devices that can automatically collect water samples. This suite of gages with autosamplers collects information on key pollutants entering the lake in the northern, middle and southern sections. More importantly, they can be programmed to collect samples during high flow events to better determine loading of contaminants. Measuring loading during high flow events is important because it is during the snow melt and heavy rains that high water carries the majority of pollutants to the lake.

These gages will be on-line for at least a 2-year period. Funding will be sought to keep the gages running farther into the future, as they can be used to sample for many contaminants of concern and are a valuable resource for the community. Among other uses, the information collected will be used in a computer model being worked on by Professor Doug Haith at Cornell and the Watershed Network to predict the loading of phosphorus and sediment to the lake under different conditions. (Watch for an article on modeling in a future issue of *Network News.*)

Visit **www.cayugalake.org** for links to the gaging stations mentioned above. Contact Roxanna Johnston, Watershed Coordinator for the City of Ithaca, at roxannaj@cityofithaca.org if you would like to know more about this project or the partnering organizations.

Concentration Versus Load

Water samples collected from the lake or creek are sent to a laboratory in order to identify how much of certain contaminants are present. Taking total phosphorus as an example, the result of the test tells how much phosphorus is in the water, such as 0.02 micrograms of phosphorus in one liter of water. This information, which is the concentration of phosphorus in the water sample, is useful but it does not quantify how much phosphorus the creek is transporting.

In order to determine the quantity of a pollutant that a creek is carrying, an additional piece of information is needed – flow. Once the amount of water flowing in the creek at the time of sampling is known, we have a much better grasp on the told amount of phosphorus that is moving in the creek at that time. A calculation using the concentration and the flow gives the phosphorus loading. The US Geological Service gages measure the water flow in creeks.

To illustrate this, if I know that one piece of chocolate has 1 gram of fat then I know the concentration of fat in each piece of chocolate I eat. If I am concerned about how much fat I eat in one sitting, this information alone is not enough. I must also to be aware of how many pieces of chocolate I eat, which will tell me the fat load from the chocolate.

Roadside Ditches Link the Land to Streams

By Sharon Anderson, Watershed Steward

During heavy rains, roadside ditches whisk away excess water in order to keep our homes and roads safe from localized flooding. On a landscape scale, however, ditches may actually increase flooding because they directly link stormwater to streams. Highway departments and property owners both play a role in balancing the benefits of roadside ditches with water quality concerns.

Credit: Rebecca Schneider

This research station was set up by Dr. Schneider to measure what contaminants move via roadside ditches to nearby streams.

Benefits of Roadside Ditches

In order to maintain safe, durable roads, highway departments vigilantly clear snow, patch potholes and fix washouts. On average about one quarter of the highway budget goes to tasks related to drainage, which annually totals one billion dollars statewide. Without this conscientiousness to keep roads well drained, water enters the road from the sides, surface cracks and via capillary action from underneath. The results are frost heaves, potholes, cracks, flooded roads and washouts. Of the suite of tools used to ensure drainage, roadside ditches are the most visible.

The Downside of Ditches

While the benefits are clear, we are just beginning to understand the problems resulting from roadside ditches. Dr. Rebecca Schneider of Cornell University is quantifying the water and contaminants what move through road ditch networks. Ditches increase the amount and rapidity with which water reaches streams. Where there is a high density of ditches, they quickly drain water from the land short circuiting the recharge of groundwater. In addition, the ditches are both a source (especially of soil) and conduit of contaminants. Let's look at these water quantity and quality issues in more depth.

When there is more water, such as rain or snow melt, than can soak into the ground, it moves over the land's surface as runoff. The amount of runoff increases where surfaces are impervious to water such as driveways, walkways, buildings, patios, etc. Often, the water draining from these surfaces is directed to a roadside ditch in an effort to protect buildings and other structures. Very little water is allowed to soak into the soil as it is quickly transported off the property and to a nearby creek via a ditch. This efficient conveyance of water drains the nearby land and carries an unnatural amount of water to creeks, which then rise higher and more rapidly.

Unfortunately, water is not the only substance that moves via ditches. As the storm runoff moves over the land it picks up contaminants such as pet wastes, oil dripped on a driveway, and trace amounts of metals from the operation of cars and airborne soot washed to the ground. All these, and more, are whisked to waterways without a chance for them to be naturally treated by soil microbes or plant uptake.

The road ditches can themselves be a source of contaminants. In the Cayuga Lake watershed, sediment is a top concern. When the vegetation in road ditches is scraped out, the rapidly moving stormwater scours the ditches and transports the loosened soil. The ditches also carry downstream great qualities of the gravel washed into the ditch from the road edge. "Approximately 30 tons of material can be eroded from a mile of ditches before you can see the damage!" according to David Orr in *Roadway and Roadside Drainage,* page 71. That's a lot of soil to dump into a waterway. If instead the soil settles out in a low section of a ditch, crews have a lot of soil to remove the next time they clean the ditch.

A Balancing Act

There are things both highway crews and homeowners can do to reduce the concerns associated with road ditches while keeping the benefits.

Highway crews can look for ways to disconnect road ditches from streams. When possible, send water to a detention pond or wooded area. Keep ditches as small as possible to do the job; most ditches are deeper and expose more soil than necessary. This excess capacity exacerbates erosion, creates a safety hazard for cars and causes instability problems for the roadway. A shallow 1:2 or flatter slope is ideal. When well shaped, a ditch is generally self-cleaning, can be mowed, and requires only minor routine maintenance. When ditches are cleaned, remove soil only until the original shape is reclaimed then seed or otherwise stabilized the bare soil promptly. When ditching on slopes, check dams, rock fill and diversion ditches may be needed.

Property owner adjacent to a roadside ditch can help keep ditches functioning properly and protect water resources. Don't fill the roadside ditch. This includes not using it to dispose of autumn leaves, brush or trash. Accept

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Trees at Work *continued from cover*


Credit: NRCS

EPA's Chesapeake Bay Program writing in the Bay Journal, "Forests are the best land cover for improving water quality... Trees capture, filter and retain water as well as absorb the excess nitrogen and phosphorus… The capacity of forests to absorb and store runoff is almost 20 times greater than a parking lot and up to six times greater than a lawn… (F)orests retains 85 percent of the airborne reactive nitrogen they receive. We know that forests serve other key roles too. They protect and filter the drinking water for … watershed residents. They moderate water temperatures in streams, stabilize flood plains and protect streambanks. They reduce energy costs, provide countless recreational opportunities and increase property value. Just think of the expense if we had to build wastewater treatment facilities to remove all the nitrogen and phosphorus that our forests do for free. Or the cost of flood control structures if our forests weren't effectively holding all that water…"

If you are planting a tree, consult an arborist or garden center to select the best type of tree for the site. Different trees have different tolerance of flood conditions, absorption rates, growth rates and life spans. Putting the right tree for in the right place will bring years of beauty and environmental enhancement.

How Much Difference Can Trees Make? A lot!

- A Wisconsin study quantified the stormwater benefits of trees. In a residential area, the tree canopy reduced stormwater runoff by 22 percent. In an urban area, the trees reduced the peak flow of stormwater runoff by 9.4 percent and the total stormwater volume by 5.5 percent.
- The US Forest Service found that in a 1-inch rainstorm over 12 hours, the interception of rain by the canopy of the urban forest in Salt Lake City reduced surface runoff by about 11.3 million gallons, or 17 percent.
- The City of Roanoke, Virginia found that tree canopy provides 64 million cubic feet in stormwater retention capacity, valued at $128 million. After realizing the contribution of trees, the Roanoke city council put in their comprehensive plan increasing tree canopy from 25 to 40 percent.

Visit *www.cayugalake.org* to learn some surprising facts about the value of trees.

Roadside Ditches Link the Land to Streams *continued from page 6*

plants in the ditch. Unmowed weeds and grasses are the best cover, with mowed grassed as second best. If the slope is steeper than 1:2, it is safer to weed whack than mow. If you would like to plant more attractive plants in the ditch, check first with the highway superintendent. When a ditch is scraped out and promptly seeded, call the highway department to say thanks. If not, request that it be seeded or otherwise stabilized. Generally, highway superintendents are elected positions; make stormwater an election issue. Highway crews work within legal right of ways. If the existing right of way does not allow for a shallow slope, offer to let the ditch be widened to improve the slope.

Reduce runoff from your property by safely keeping water on your property. Plant trees, put in a rain garden and rain barrels, have less impervious cover, mulch and improve soil porosity, and direct gutters to vegetated areas where the water can soak into the soil.

Support your town's effort to manage stormwater such as ordinances that limit runoff after construction, prohibit connections between a residence and the ditch, or require a buffer of trees along a creek. Understand that your tax dollars are well used when they fund compliance with state and federal stormwater regulations.

ANNOUNCEMENTS

To register or learn more about any of these programs, please contact the Watershed Network at manager@cayugalake.org or 607-532-4104.

Spring Fling: Native Plants for Beauty and More
April 4, 7:00-8:30 p.m.
Cooperative Extension of Tompkins County, 615 Willow Avenue, Ithaca
Ephemeral bloodroot, tall purple asters, delicate maidenhair ferns and the vibrant fall leaves of chokeberry only give hints at the diversity and beauty of native plants. Dan Segal of the Plantsmen Nursery in Lansing will share the many benefits of incorporating native plants into the home landscape. Learn how to attract birds and butterflies, bring color to your garden, and find the right plants for a rain garden. Free. Registration is required.

Annual Shrubs Give Away
Our annual shipment of shrubs to stabilize streambanks will arrive at the end of April. This year's selection is expanded to include silkie dogwood, pussy willows, bayberry and sandbank and streamco willows. Reserve yours today.

NYS Federation of Lake Assoc. Annual Conference
May 4, 5 and 6
White Eagle Conference Center, Hamilton, NY
The potpourri of topics includes Invasive Species Control, the Values of Wetlands, Lake Ecology, Sediment Issues and much more. The programs are geared to citizens interested in lakes. Visit www.nysfola.org for details.

Fall Creek Clean up
May 5, 9:00- 11:00 a.m.
Help remove many pounds of trash from the creek and its bank. Contact the Watershed Network for meeting locations.

Water Week Celebration
May 5, 9:00-2:00
Farmers Market, Ithaca
Drinking water taste test, interactive exhibits including live fish, and much more, all free.

Lakefest
Mark your calendar now for the next Lakefest on August 18, 2007. We started a new tradition of giving away door prizes throughout Lakefest. You may go home from the festival with as prize as well as happy memories and new knowledge! The list below continues our thanks, begun in the previous newsletter, to donors that provided gift certificates at Lakefest 2006:

- Fox Dealerships, Auburn
- Montezuma Winery, Seneca Falls
- Deerhead Inn, Seneca Falls
- D.A.'s Liquor, Seneca Falls

Other events still in the planning stage include a rain garden training in Cayuga County, identifying stream insects, and tree plantings to stabilize creeks. For updates visit www.cayugalake.org.

The Mission... *The Cayuga Lake Watershed Network seeks to protect and improve the ecological health, economic vitality and overall beauty of the watershed through education, communication and leadership.*

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Education
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