

Conservation Currents

Northern Virginia Soil & Water Conservation District
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Water, Water, Everywhere But Where Does Our Water Go?

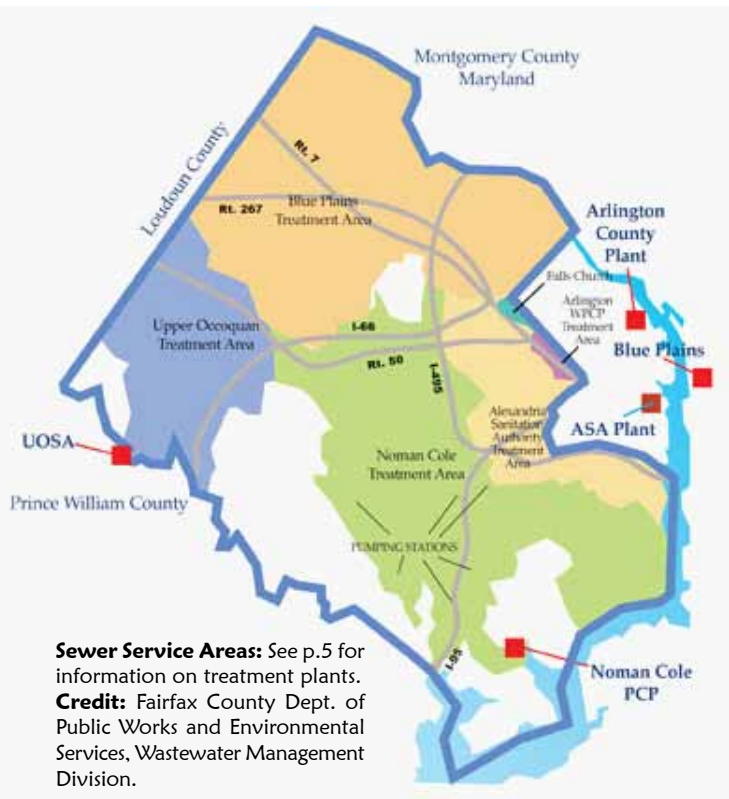
by Devy Jagasia

Have you ever thought about where our water goes when we finish taking a shower or after we have washed the dishes? Not many of us think frequently about what happens to our water after we are done with it. Our wastewater goes through a rigorous treatment process after we have finished washing, bathing or cooking.

But why treat wastewater? Clean water is critical for fish, wildlife, and for health safety reasons. When treated wastewater is discharged back into our rivers, the fish and other aquatic wildlife that depend on these waterways are in direct contact with it. (Unlike water from your kitchen sink, rainwater entering curbside storm drains is piped directly to the nearest stream, and that runoff is not treated. Only rain in the storm drain!)

Many pollutants present in wastewater can negatively affect ecosystems and human health:

- Decaying organic matter and debris can use up dissolved oxygen so fish and other aquatic biota cannot survive.
- High concentrations of nutrients (phosphorus and nitrogen) lead to over-fertilization of receiving waters. This causes huge algae blooms which reduces available oxygen, harms spawning grounds, alters habitat and leads to a decline in key species. Ammonia, a form of



nitrogen, can be toxic to aquatic organisms.

- Chlorine compounds and inorganic chloramines can be toxic to aquatic invertebrates, algae and fish.
- Bacteria, viruses and disease-causing pathogens can pollute beaches and contaminate shellfish populations, leading to restrictions on

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Artistic Rain Barrel Silent Auction

Sat., June 11, 5-7 p.m., Green Spring Gardens



Twenty-five beautifully painted and decorated rain barrels at libraries, schools, businesses and community centers across Northern Virginia have garnered newfound attention to rain barrels.

The Northern Virginia Rain Barrel Program – which brings low-cost rain barrels area residents – will be holding a combined silent auction and artists’ reception. Each rain barrel artist volunteered their time and we are proud to be working with them. Proceeds from the silent auction will benefit the program, and light refreshments will be served.

View all the artistic rain barrels on the Northern Virginia Soil & Water District site, www.fairfaxcounty.gov/nvswcd/rainbarrelart.htm

The event will be held on June 11, 5-7 p.m. at Green Spring Gardens, 4603 Green Spring Road, Alexandria, Virginia 22312. Please RSVP to rainbarrel@fairfaxcounty.gov or by calling 703-324-1428. We look forward to seeing you there! ♣

Watershed Friendly Home, Garden & Horse Farm Tour

Sunday, June 19, 1-5 p.m.

Get inspired to create an environmentally-friendly landscape at your home, school, or business! Visit gardens throughout Fairfax County featuring vegetated roofs, rain barrels, backyard wildlife habitat, composting, native plant species and more. Local residents open their gardens and share their experiences

landscaping with our water resources in mind.

For a list of site locations, descriptions, directions, and resources for your own garden, see: www.fairfaxcounty.gov/nvswcd/gardentour.htm

This event is co-sponsored by the Northern Virginia Soil and Water Conservation District and the Fairfax Master Naturalists. ♣

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We All Benefit From Trees, But How Much?

Quantifying Services Provided By Fairfax County's Tree Canopy

by Jessica Strother, Urban Forester
 Fairfax County Urban Forest Management Division

Trees... needed shade, a thing of beauty, a perch for a bird, and a challenge to deal with those leaves in the fall! This is what some people in our region think of when they think about trees, unless they slow down and take a closer look. In Fairfax County and in communities throughout the country, natural resource managers have been taking a closer look and calculating the benefits provided by trees and forests.

In 2009, the Fairfax County Urban Forest Management Division embarked on a project to measure and quantify the benefits derived from our trees on a countywide basis. State of the art forest analysis software from the



Admiring a Willow Oak, *Quercus phellos*
 Lawrence Morris, University of Georgia, Bugwood.org

Tree Facts

Serving Size: 27 in DBH (68.6 cm)
 Species: Red Maple, *Acer rubrum*

Amount Per Serving	
Carbon sequestered 222 lbs	avoided 466 lbs
<small>% Annual Value</small>	
Total Carbon 690 lbs	
O₃ \$4.24	
VOC (Volatile Organic Compounds) \$ 1.57	
NO₂ (Deposited) \$ 1.83	
NO₂ (Avoided) \$ 6.06	
SO₂ (Deposited) \$ 0.54	
SO₂ (Avoided) \$ 2.37	
PM₁₀ (Deposited) \$3.83	
PM₁₀ (Avoided) \$ 0. 71	
Conserved Kilowatt/hours 155 kWh	
Reduced oil/natural gas consumption 56 therm(s)	
Stormwater intercepted 3,472 gallons	
Property value increase \$168.00	Natural Gas \$79.09
Storm water \$27.77	Electricity \$21.76

DBH: Diameter at Breast Height
O₃: Ozone, an air pollutant affecting human health
NO₂: Nitrous dioxide, a greenhouse gas and air pollutant which can impact human health
SO₂: Sulfur dioxide, an air pollutant which can impact human health and precursor to acid rain
PM₁₀: Particulate matter of 10 micrometers or less, which can impact human health
 For more information, see www.unri.org

U.S. Forest Service called “i-Tree” was used in this project. i-Tree software was used to provide a broad picture of the entire urban forest and uses local field data along with air pollution and meteorological statistics, to quantify forest structure, environmental effects and economic values provided by trees in various settings.

Geographic Information System tools were used to randomly select areas where field data collection would occur and to ensure that adequate levels of data sampling occurred within 12 land use categories. These categories included residential, governmental, commercial, industrial and forested areas. County and Virginia state foresters collected data on tree species, trunk size, canopy coverage, ground covers and imperviousness of soils from 200, 1/10 acre plots

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scattered throughout the County. Finally, all of this information was entered into the i-Tree software interface and sent off to the U.S. Forest Service for final data processing. In turn, the U.S. Forest Service produced a report that included the following statistics:

i-Tree Report Results

- **Number of trees in Fairfax County:** 20,900,00
- **Most common trees:** Red maple, American beech, Tulip poplar
- **Carbon stored:** 3,879,000 tons/year = (value; \$21.7 million/year)
- **Carbon sequestration:** 218,000 tons/year (value; \$4.51 million/year)
- **Building energy savings:** value; \$11.9 million/year
- **Avoided carbon emissions:** value; \$421 thousand/year
- **Structural values:** value; \$29.2 billion

Notes:

1. A ton is equal to a short ton (U.S. = 2,000 lbs)
2. Structural value is the value based on the physical resource itself (cost of replacing with a similar tree)
3. For more information about calculations, see unri.org

Other studies demonstrate that approximately 371 million cubic feet of storm water are intercepted and slowed by the County’s tree canopy during a typical storm event. National studies and research conducted by others are on-going to analyze and quantify the socio-economic and psychological benefits people gain from the trees and forests around them.

Why is this of interest and a concern? Over the past 40 years Fairfax County has lost at least 48% of its tree canopy. This is due to residential/commercial development, an increase in storms and their intensity, invasive alien plants taking over trees and their habitats, and the public’s need for more information about how to care for and protect trees and community forests. Fairfax County has approximately 41% tree canopy at present, which is somewhat better than adjacent jurisdictions.

The Tree Nutrition Label was created using the i-Tree suite of software tools and developed by the USDA Forest Service, academia and the public to illustrate the ecosystem benefits provided by urban trees. For more information go to www.unri.org

Locally, to learn more about trees and services provided by Fairfax County go to www.fairfaxcounty.gov/dpwes/environmental/trees.htm

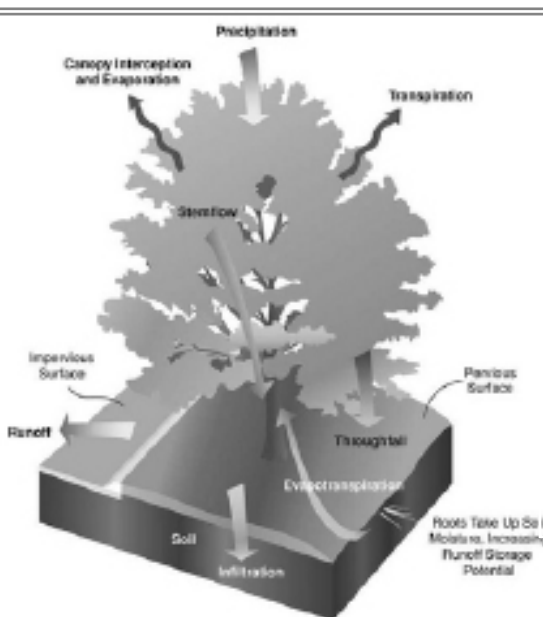
Your 24 inch Red maple will intercept 8,028 gallons of stormwater runoff this year.

Urban stormwater runoff (or “non-point source pollution”) washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life and the health of our entire ecosystem can be adversely effected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:

- Intercepting and holding rain on leaves, branches and bark
- Increasing infiltration and storage of rainwater through the tree’s root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

For more information visit: The Center for Urban Forest Research



To take a closer look at some of the benefits and value of trees in your community, go to www.treebenefits.com

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human recreation and shellfish consumption.

- Metals, such as mercury, lead, cadmium, chromium and arsenic can have acute and chronic toxic effects on wildlife and human health.

So how do we get rid of these contaminants? There are three main processes for preparing wastewater for discharge.

Primary Treatment: Sedimentation and Screening of Large Debris. First, the liquid is separated from the solids using screens and large settling tanks. Water passes through sand and gravel and heavier solids are filtered out.

Secondary Treatment: Biological & Chemical Treatment. Secondary treatments vary from one treatment plant to the next, and usually include biological and/or chemical treatment. One of the most common biological treatments is the activated sludge process, in which primary wastewater is mixed with bacteria that break down organic matter and clean the water. Oxygen is pumped into the mixture. A clarifying tank allows sludge to settle to the bottom and then the water moves to the next step.

Tertiary Treatment: Advanced Treatment. Coagulation, filtration and disinfection take place in tertiary treatment. A coagulant, such as aluminum sulfate, is added, causing suspended particles to consolidate and settle. Filtration removes organic matter, microorganisms and mineral compounds, keeping excess nutrients out of rivers and wildlife habitat. The water is chlorinated or ultraviolet rays are used in order to kill any remaining bacteria. After, a solution is added to remove residual chlorine.

These processes clean out suspended solids, pollutants, metals, pathogenic and non-pathogenic microorganisms, organics, as well as nitrogen and phosphorus. In our area, the wastewater is then discharged to either the Occoquan or the Potomac River, which flows to the Chesapeake Bay.

Since 1972, U.S. rivers, lakes, and streams have been protected through the Clean Water

Act. The stated objective of the act is “to restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The Clean Water Act established specific national goals concerning the health of United States surface waters, enforced by the Environmental Protection Agency (EPA). As wastewater treatment plants get older and new technologies become available, plants are required to improve the quality of the water they discharge.

There are five main treatment plants taking care of wastewater from Fairfax County residents. Each plant has taken steps to increase capacity and improve their water quality to handle population increases and tighter standards. Many of our local treatment plants bring home top awards for superb water treatment!

1. Noman M. Cole, Jr. Pollution Control Plant. In Lorton, Virginia, bordering Pohick Creek, Fairfax County’s Noman Cole Treatment Plant has been in operation since 1970. The Noman Cole plant is the primary recipient of Fairfax County wastewater, treating 67 million gallons per day or 42%. www.fairfaxcounty.gov/dpwes/wastewater/noman_cole.htm

2. Alexandria Sanitation Authority. Near the Woodrow Wilson Bridge, the Alexandria Sanitation Authority’s plant takes in wastewater from the city of Alexandria and a portion of Fairfax County. Water is discharged into Hunting Creek / Cameron Run at the Potomac River. This plant treats 32.4 million gallons of Fairfax County wastewater per day or 20%. <http://alexsan.org>

3. Blue Plains Treatment Plant. Located on the southernmost tip of the District of Columbia, Blue Plains takes wastewater from D.C., Maryland, and Virginia, including a portion of Fairfax County. In operation since 1938, Blue Plains today is the largest advanced plant in the country, with a total capacity of 370 million gallons per day. The plant treats 31 million gallons of Fairfax County wastewater per day or 19%. <http://www.dcwasa.com/about/facilities.cfm>

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2011 High School Hot Shots

The Conservation District is fortunate to work with many talented young people. Each year, we work with students across Fairfax County to develop environmental knowledge through the Envirothon program. Teams of five students compete, digging into their knowledge of soils, aquatics, forestry, wildlife, estuaries, and a special topic, which this year was focused around the Chesapeake Bay TMDL. The top two teams from Fairfax County went on to the Area II regional competition. We are proud to announce that the Hidden Pond Nature Center group, representing Northern Virginia SWCD, took first place at regionals. They studied hard and did well. At the statewide level competition at Camp Hanover in Mechanicsville, the Hidden Pond Nature Center team took second place overall! Congratulations!

The Conservation District also sends a group of judges to the Fairfax County Regional Science and Technology Science Fair each spring in search of students who are presenting interesting and innovative research projects in the field of soil and water conservation. Many thanks to our 2011 judges, Judi Booker, Suzanne Dorick, Josefina Doumbia, Devy Jagasia, Krise Nowak, and Jim McGlone. Here we offer the abstracts of the students' projects we chose to recognize with the hope that you enjoy them as well. (The abstracts were edited for length.)

First Place: The Effect of Cattails in Reducing Nitrate Pollution, Kiren Ajrawat, Freshman, Oakton High School

This project is the result of bioassay experimentation on the effect of the Cattail plant on the Nitrate pollution level of wet stormwater ponds. The initial idea was to locate stormwater ponds that naturally grow Cattails and determine if the Nitrate levels of these stormwater ponds were less than the ponds without any Cattails growth.

Nitrate pollution was present in all stormwater pond samples from all geographic locations



Hidden Pond Nature Center Envirothon Team

Neal MacDonald, Liam Berigan, Ben Simon, Owen Mulvey-McFerron, Murjan Hammad, Clairisse Cheniae

where samples were taken, but the level of pollution was significantly higher in stormwater ponds without Cattails. A positive correlation existed between the reduced percent of Nitrate in the stormwater ponds with cattails.

Results may serve to promote community education, policies and further research that address how plants can be used as a filtration method in absorbing pollutants from various stormwater pond locations so that Nitrate pollution does not impact local watersheds and bays.

Second Place: Vitamin C a Key to Submerged Aquatic Vegetation, Sae-Li Kim and Sivasankari Rajamarthandan, Juniors, Robinson Secondary

The purpose of this experiment was to assess the effect of additional vitamin C concentrations on the change in mass of anachris, a type of submerged aquatic vegetation. It was hypothesized that the anachris grown in water with a vitamin C concentration of $4.66 \times 10^{-5} \text{M}$ would have the greatest increase in mass.

The three real trials showed that $2.33 \times 10^{-5} \text{M}$ and $4.66 \times 10^{-5} \text{M}$ had the greatest average increase in mass with 0.91g and 0.90g respectively. Thus vitamin C is vital to increasing plant mass, and the DO levels and the O_2 levels indicated that Vitamin C has no negative effect on oxygen underwater.

Therefore, vitamin C could be a possible temporary solution to reviving the low levels of submerged aquatic vegetation like anachris in eco-

systems like the Chesapeake Bay and maintaining the health of the plants under stressful situation like pollution.

Third Place: The Study of Nitrogen Deposition on Wisconsin Fast Plants, Mahtaab Bagherzadeh, Ann Vo and Nicole Wright, Seniors, Stuart High School

Ongoing research concerning the effect of anthropogenic nitrogen deposition in varying ecosystems has revealed that an increase or decrease in plant productivity is dependent on the region, though numerous studies have neglected the component of soil structure. Thus this investigation was designed, which examines the effect of nitrogen deposition in various soils on the growth of *Brassica rapa*.

Data analysis determined that the control group's growth increased continuously over time; the 1% and 2% group increased with some fluctuation, although the 2% group fluctuated decreasingly towards the end; and the 3% group initially increased, but regressed notably during the last week. Root and shoot masses tended to correlate inversely with acid concentration. The height decreased due to increasingly large amounts of nitrogen present.

This study demonstrated the harms of excess

nitrogen, underlining how crucial it is to retain stable levels of anthropogenic nitrogen in an environment.

Honorable Mention: Grass Species and Nitrogen Runoff, Rachel Campbell, Sophomore, West Potomac High School

High nitrogen levels found in various waterways cause an excess of nutrients which result in oxygen deprivation and fish deaths. Is there a grass species that prevents nitrogen from lawn fertilizers, from getting into runoff and eventually finding its way into waterways? This project looks at which grass species is best at preventing high nitrogen levels found in runoff from three different fertilizer amounts. My hypothesis was the Kentucky bluegrass would produce the lowest Nitrogen levels found in fertilizer runoff compared to the other grass species.

The experimental results rejected my hypothesis by showing that Rye grass produced the lowest nitrogen levels found in fertilizer runoff, regardless of the fertilizer amount. The experimental results also showed that Kentucky bluegrass produced the highest nitrogen levels found in fertilizer runoff of the three grass species tested; Kentucky bluegrass, Rye grass, and Tall fescue. ♣

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4. Upper Occoquan Sewage Authority.

Adjacent to Bull Run Regional Park, the Upper Occoquan Sewage Authority plant was formed in the 1970s and serves jurisdictions in the Occoquan watershed: Fairfax County, Prince William County, Manassas and Manassas Park. Importantly, the sewage plant is upstream of the Occoquan Reservoir, where a good portion of southern Fairfax County's drinking water comes from. This plant treats 27.6 million gallons of Fairfax County wastewater per day or 17%. <http://www.uosa-construction.org/>

5. Arlington Water Pollution Control Plant. At Four Mile Run and the Potomac by Reagan National Airport, the Arlington plant treats water from Arlington, Falls

Church, and Fairfax County. This plant treats 3 million gallons of Fairfax County wastewater per day or 1.9%. [http://www.arlingtonva.us/departments/environmentalservices/wpcp/Environmental Services/Wpcp/Wpcover.aspx](http://www.arlingtonva.us/departments/environmentalservices/wpcp/Environmental%20Services/Wpcp/Wpcover.aspx)

Others include the Prince William County Service Authority, which treats 100 thousand gallons of wastewater per day from Fairfax County, or 0.06%; as well as Colchester, a private wastewater treatment plant (80 thousand gallons per day for Fairfax County, or 0.05%).

Many of the treatment plants also provide tours, which are not as malodorous as you might think! More information is available at the websites above. ♣

Devy Jagasia is a graduate student in Environmental Science at George Mason University.

Help Keep Track of Turtles!

Frogs, toads, snakes, turtles, salamanders, and lizards. These reptiles and amphibians are the subject of study of herpetologists. The word herpetology comes from the Greek, herpetos, for creeping – or was it creepy? – animals. You can find all of these lovely creatures right here in Northern Virginia.

Turtles, in particular, are one of the cuter ambassadors for the science of creeping things. This year – which happens to be the year of the turtle – the Virginia Herpetological Society is asking for your help reporting sightings of the Eastern Box Turtle, *Terrapene carolina carolina*. (*Terrapene* comes from the Algonquin word for turtle, just like the diamondback terrapin from Maryland.) Eastern box turtles only grow to about 8 inches long but can live up to 30, 50, 80, or even 100 years old!

Our eastern box turtle friends are susceptible to human activity, especially the activity of our

cars, lawn mowers, and bulldozers. They have been listed as lower risk - near threatened on the International Union for Conservation of Nature's Red List of Threatened Species. So every time you see an eastern box turtle this spring, help keep track of what's happening to them. Go online to the Virginia Herps Society website, tiny.cc/boxturtle, and fill out their handy form letting them know where exactly you saw your box turtle and what condition it was in.

And one more thing: if you see a turtle trying to get to the other side of the road and you'd like to give it a hand, don't set it back where it started. These guys have internal homing devices, so it will just start crossing the road again. Also, never throw a turtle! They likely will not survive the fall. If you want to help a turtle across the road and out of harm's way, any turtle would surely appreciate a quick, safe trip to help them along. ♦

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Credit: Virginia Herpetological Society



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