

Virginia Water Central

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South Holston Lake in Washington County, Virginia, April 15, 2012.

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Editor's Comment



Seeing Virginia's Waters at Water's Pace

By Alan Raflo, *Virginia Water Central Editor*

What could one see, do, and learn on a 400-mile walk and paddle across Virginia? Laurel Woodworth, a stormwater and watershed planner at the Charlottesville office of the Center for Watershed Protection, set out on May 9, 2012, to answer that question. As she states it, her "Walk Across Virginia" is "a 400-mile mountain-to-sea exploration of Virginia's water resources and the committed people who work to protect them."

With Ryan Williamson, Laurel started on the banks of the New River at Narrows in Giles County, not far from the West Virginia state line. Stretching before them were mountains, valleys, the Blue Ridge, creeks, rivers, Piedmont hills, the Coastal Plain, the Chesapeake Bay, and the Eastern Shore. Using roads, trails, and waterways, Laurel aims to conclude the mostly self-powered journey in late June on the Atlantic Ocean side of Hog Island, in Northampton County.

Along the way, she plans to meet and learn from people who study, manage, protect, and use Virginia's water resources. She hopes to interview "a variety of fine folks involved in some facet of water resource protection. University professors and dam keepers, volunteer water monitors and park supervisors, tribe members and river guides, county planners and farmers—all with stories of success and failure to share."

Moving at about the speed a river flows, Laurel's journey promises to show the vitality, variety, and complexity of Virginia's watersheds—characteristics that make water resources work challenging and fascinating.

You can follow Laurel's journey at <http://walkacrossvirginia.blogspot.com/>.



In Craig County's Johns Creek Valley



On the James River

(Photos by Ryan Williamson)

TEACHING WATER Especially for Virginia's K-12 teachers

This Issue and the Virginia Standards of Learning

Below are suggested Virginia Standards of Learning (SOLs) that may be supported by items in this issue. The SOLs listed are from Virginia's 2010 Science SOLs and 2008 Social Studies SOLs. Abbreviations: BIO = biology; CE = civics and economics; ES=earth science; GOV = Va. and U.S. government; LS=life science; WG = world geography.

Newsletter Section	Science SOLs	Social Studies SOLs
Feature: Catching Up on Water News	4.5, 4.9, 6.2, 6.5, 6.7, 6.9, LS.11, ES.6, ES.8, ES.10, BIO.8	CE.7, WG.2, WG.7, GOV.8, GOV.9, GOV.16
Science: Trees and Water	4.9, LS.4, ES.6, BIO.2, BIO.8	WG.7
Water Status Report	3.9, 4.6, 4.9, 6.7, LS.6, ES.6, ES.8, ES.12.	WG.2

FEATURE ARTICLE

Catching up on Water News and Views

By Heather Vereb and Alan Raflo. Heather is a Blacksburg-based environmental scientist working in water quality.

The section presents a selection of items on water developments in Virginia between September 2011 and April 2012. Following the news items is a collection of photographs taken throughout 2011 and early 2012.

Except as otherwise noted, localities mentioned are in Virginia. All Web sites listed were functional as of May 15, 2012.

Frequently used abbreviations: DEQ = Virginia Department of Environmental Quality; EPA = U.S. Environmental Protection Agency; TMDL = Total Maximum Daily Load.

Try Out *Water Central's* Online News Service

If you're looking for news articles on *particular water-related topics*, visit the Virginia Water Central News Grouper at <http://vawatercentralnewsgrouper.wordpress.com/>.

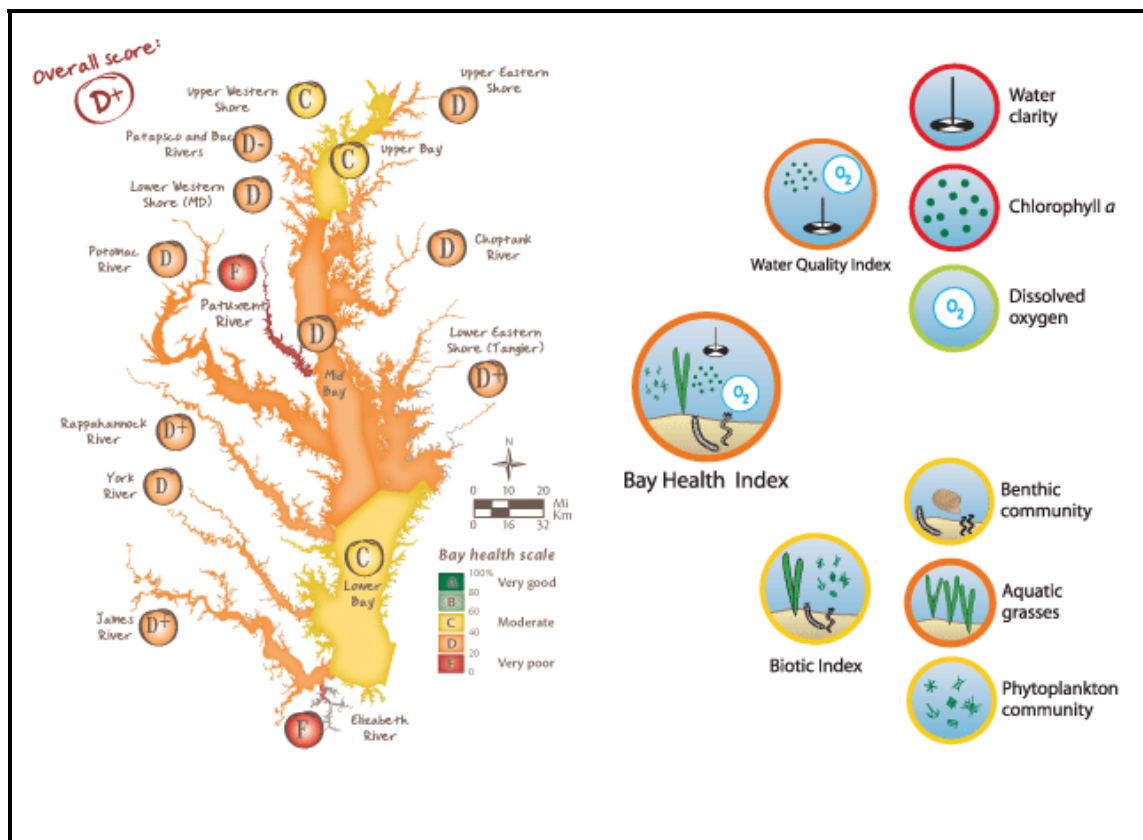
The Bay TMDL: Progress on Paper but Uneven Progress in the Water

- In an attempt to help localities determine the actions needed to meet pollution-reduction targets established under the Chesapeake Bay Total Maximum Daily Load (TMDL) and state Watershed Implementation Plans (WIPs), the Chesapeake Bay Program announced in September 2011 the release of the **Chesapeake Assessment and Scenario Tool**. A Virginia-specific version—the Virginia Assessment and Scenario Tool, or VAST—of the online modeling program is available. Amidst concerns that the existing model appeared not to work as well for local targets as it did for state-level or river basin-level targets, U.S. EPA Region III Director Shawn Garvin stated that the agency would work to correct model problems. (Chesapeake Bay Program News Release, 9/27/11; letter from Shawn Garvin to the secretary of the Maryland Department of the Environment, October 5, 2011; *Virginian-Pilot*, 10/23/11)
- On November 18, 2011, the staff of the Virginia Senate's Finance Committee presented a report estimating the potential maximum **cost for the Commonwealth to implement Chesapeake Bay restoration actions to be between \$13.6 and \$15.7 billion**. These costs are for Virginia's WIP, the set of actions Virginia is required to implement fully by 2025 (with 60 percent to be implemented by 2017) under the Bay TMDL. The report attempted to present the maximum potential costs and stated the actual costs could be less, depending on which options Virginia chooses to reach pollutant-reduction targets. A section entitled "Costs of Failing to Meet Cleanup Goals" identified tourism, the oyster industry, reduced costs for treating drinking water, health, recreation, increased property values, and scenic beauty as *benefits* of the clean-up effort. (Report to the Virginia Senate Finance Committee, 11/18/11; *Richmond Times-Dispatch*, 11/19/11)
- In December 2011, Bay states and the District of Columbia submitted draft **Phase II WIPs** (Virginia submitted its draft Phase II WIP on December 15). Phase II plans are to identify the roles of local stakeholders (governments, conservation districts, farmers, developers, and other entities) in meeting the Bay TMDL goals for reducing nitrogen, phosphorus, and sediment inputs to the Bay and its tributaries. After receiving EPA feedback on the draft and collecting strategies from localities to meet local and regional pollutant reductions, Virginia submitted its final Phase II WIP before the March 30, 2012, deadline. Virginia's document was **open for public comment until May 31, 2012**, and a series of public meetings was held around the state between May 9 and 31. (Virginia Department of Conservation and Recreation "Bay TMDL" Web site, <http://www.dcr.virginia.gov/vabaytmdl/index.shtml>, 5/8/12; Virginia Governor's Office News Release, 3/30/11)
- In January 2012, **Virginia submitted to the U.S. EPA the Commonwealth's planned "milestones"** of actions for the upcoming two-year period under the Bay TMDL. In May 2009, the Chesapeake Executive

Council—executives from the Bay states, the District of Columbia, the Chesapeake Bay Commission, the U.S. EPA, and the U.S. Dept. of Agriculture—announced the concept of setting short-term goals, or milestones, for reducing the amount of nitrogen and phosphorus reaching Bay waters. The milestones are intended to help the Bay partners make progress toward overall Bay-restoration goals set by the Bay TMDL. The milestones document and other information related to the TMDL are available at the Virginia Department of Conservation and Recreation’s “Bay TMDL Virginia FAQ” Web site at <http://www.dcr.virginia.gov/vabaytmdl/baytmdlvafaq.shtml>. (Virginia Department of Conservation, <http://www.dcr.virginia.gov/vabaytmdl/>, 5/8/12)

•A February 2012 series of articles in the *Staunton (Va.) News Leader* discussed **concerns raised by Virginia localities** in response to their need to identify local actions to meet Bay TMDL pollution-reduction goals. Echoing similar comments made during the public comment period preceding the issuance of the TMDL, Shenandoah Valley farmers and local governments discussed the local actions and expenditures that may be needed to meet the TMDL-required reductions in sediment, nitrogen, and phosphorus generated by agricultural and municipal sources. According to Rockingham County Administrator Joe Paxton, the three main concerns surrounded funding, accuracy of data used in modeling, and the attainability of proposed Best Management Practices (BMPs). (*Staunton News Leader*, 2/2/12; 2/6/12; 2/9/12; 2/19/12)

•In April 2012, the **University of Maryland’s Center for Environmental Science released its annual “report card” on Chesapeake Bay biology and water quality**, based on analysis of state and federal agency data (see summary figure below). This year’s report, for conditions in 2011, had an overall “grade” of 38%, (D+, or “poor ecosystem health”), compared to 42% (“moderately poor ecosystem health”) in 2010 and 46% (“moderate ecosystem health”) in 2009. Scientists attribute poorer Bay conditions in 2011 to heavy spring rains that carried high amounts of algae-stimulating nutrients, a hot and dry summer that was conducive to algal growth and resulting oxygen depletion from algal decomposition, and heavy fall rains from tropical storms that delivered large amounts of sediment to the Bay. Detailed information about the “report card” may be accessed at <http://ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2011/>. (University of Maryland Center for Environmental Science Web site, 4/18/12)



Regional summaries and indicators used in the University of Maryland Center for Environmental Science’s 2011 Chesapeake Bay Report Card, <http://ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2011/>.

●In April 2012, Virginia Gov. Robert McDonnell and Maryland Gov. Martin O'Malley announced the results of the **2012 winter dredge survey of Chesapeake Blue Crab populations**. This year's survey showed that the overall population increased to 764 million, a 66-percent increase from the 2011 survey and the highest level since 1993. This count includes an almost tripling of the number of juvenile crabs but a 50-percent reduction in spawning-age females from 2011. The governors' announcement noted, however, that the 2012 "level [of spawning-age females] remains above the healthy-species threshold, and these types of fluctuations are neither unprecedented nor unexpected in the winter dredge survey." In the early 1990s, surveys estimated about 800 million Blue Crabs. Harvest pressure and pollution combined to reduce the population to a record low of 249 million in 2007. Virginia and Maryland implemented significant harvest restrictions in 2008. (Virginia Governor's Office News Release, 4/19/12; Virginia Marine Resources Commission News Release, 4/19/11; *Virginian-Pilot*, 4/20/12)

Communities Address Stormwater Issues

●In November 2011, the Virginia Beach non-profit organization **Lynnhaven River Now** started its "Pearl Homes" program, designed to encourage homeowners to take voluntary actions to reduce stormwater pollution from residential areas. Participants receive a list of actions they can take, such as planting trees, picking up pet waste, installing a rain barrel, and reducing fertilizer use. Those who accomplish at least 15 actions receive a yard flag bearing the image of an oyster and a pearl (see photo at right). (*Virginian-Pilot*, 11/6/11)

●In December 2011, the **Lynchburg City Council** voted to **establish a stormwater fee with collection beginning July 1**. Though the rate had yet to be finalized as of April 2012, it's predicted that the average homeowner would pay \$4 per month, with the actual amount varying depending on the area of impervious surface on a property. Debates among council members centered on the magnitude of the fee and whether real estate taxes should be lowered to compensate for it. Some council members expressed concern over how the fees could impact businesses, which may be required to pay several hundred dollars each month. As of the end of April, council members were discussing a credit system that would allow residential, commercial, and industrial property owners the opportunity to offset some of the cost by implementing measures that would reduce runoff, such as permeable pavers and rain gardens. The new revenue would allow the City to continue current work and begin planning for increased costs resulting from the Chesapeake Bay TMDL and from state stormwater regulations. (*Lynchburg News & Advance*, 1/25/11; 9/14/11; 12/13/11; 3/26/12; 4/23/12)

●The **City of Charlottesville, the Nature Conservancy, and the U.S. Army Corps of Engineers** are **collaborating to restore 9,000 linear feet of Meadow Creek**, a city stream and Rivanna River tributary that was degraded by increased stormwater runoff generated by decades of development along the U.S. Rt. 29 corridor. The project will involve streambank-stabilization measures, restoration of native vegetation, and placement of about 70 acres under a conservation easement that will limit new impervious surface (which increases stormwater runoff). (*Charlottesville Tomorrow*, 4/24/12)



Flag used to designate Virginia Beach residences working to reduce stormwater pollution. Photo courtesy of Lynnhaven River Now.

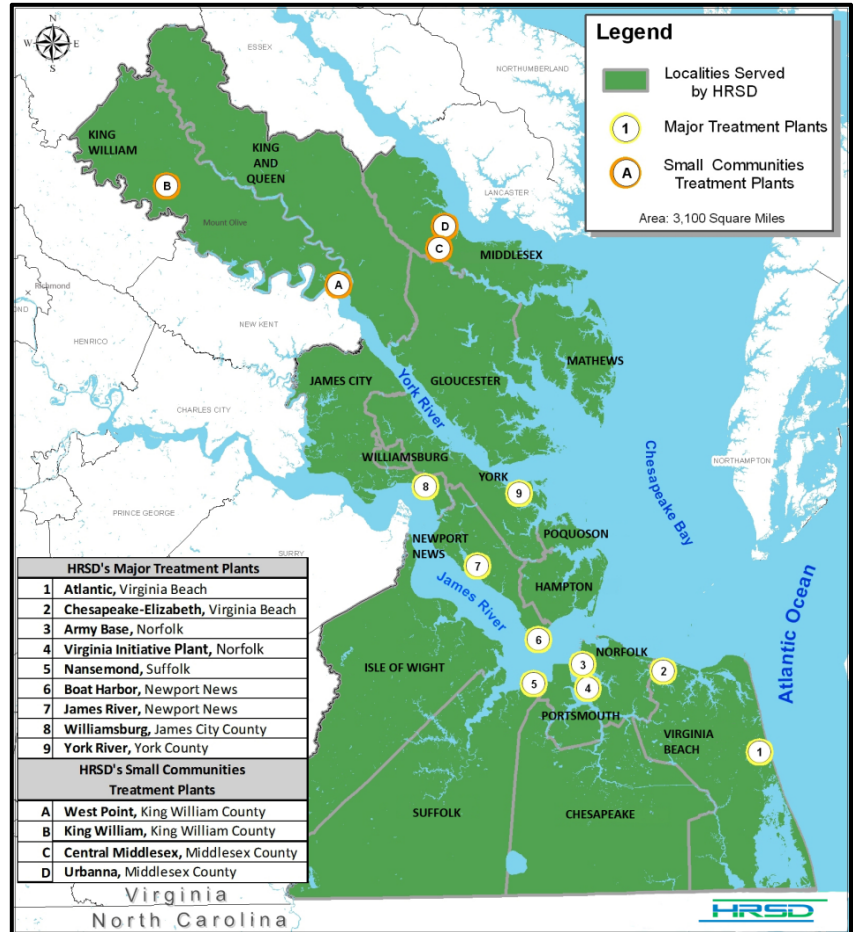
Water and Wastewater: Funding, Planning, and Growth "Snapshots"

●On February 5, 2012, Governor McDonnell's office announced a **\$750,000 Community Development Block Grant (CDBG) to the Scott County Public Service Authority** to help pay for extending public water supply to 73 households in the Angler's Way and Sloantown communities. CDBG grants are federally funded, awarded competitively, administered by the Virginia Department of Housing and Community Development, and designed to assist primarily low- and moderate-income communities. (Virginia Governor's Office News Release, 2/7/12; *Kingsport, Tenn., Times-News*, 2/12/12)

●By early 2012, after years of debate, the Rivanna Water and Sewer Authority (RWSA) had received final approvals from the city, county, and the Albemarle County Service Authority to build a **new, earthen dam on the Ragged Mountain reservoir**. The new dam will replace an existing concrete dam and increase the reservoir's height by 30 feet (and potentially by 42 feet, if needed and requested by either locality). The official signing ceremony on January 24 followed the Charlottesville city council's 3-2 vote on January 17 approving a cost-allocation agreement with the county and the planned height of the dam, and the county's approval on January 19 of the cost-allocation plan. The low bid for construction of the dam was \$21.5million. (*Charlottesville Tomorrow*, 12/10/11; *Charlottesville Daily Progress*, 1/18/12; 1/20/12; 1/24/12)

●**Wastewater infrastructure projects planned over the next 20 years by the Hampton Roads Sanitation District (HRSD)** are expected to require sewage-rate increases of between four and eight percent per year through 2031. The District is facing \$1.2 billion worth of projects over that period to improve nutrient removal (to meet stricter, Chesapeake-Bay-related requirements), reduce sewage overflows from leaks in sewage lines, and upgrade generally aging lines, pumping stations, and other facilities. HRSD serves about 1.6 million customers in southeastern Virginia (*see map of service area at right*). For several years, the District has been considering the package of infrastructure projects and how to finance them. (*Virginian-Pilot*, 7/15/09; 12/17/11)

●On April 5, 2012, the State Water Control Board approved the **request by Lake Anna Environmental Services to expand the company's wastewater discharge permit at Lake Anna Island (in Louisa County) from 20,000 gallons per day to 99,000 gallons per day**. The wastewater treatment plant currently treats an average of about 5,000 gallons per day into Lake Anna from the Lake Anna Island Project commercial and residential area. Owners of the project sought a permit for the increased capacity in order to accommodate expected further development of the area, including a medical facility. The permit expansion was opposed by the county board of supervisors, some local organizations, and a number of citizens who requested and then spoke at a Virginia DEQ public hearing in February 2012. (*Louisa Central Virginian*, 2/16/12; 4/19/12)



Hampton Roads Sanitation District Service Area. Figure from District Web site, <http://www.hrsd.com>, used with permission.

Groundwater Contamination Suits Continue in Campbell and Chesapeake

●On January 13, 2012, the **Virginia Supreme Court, by a 5-2 vote, reversed a circuit court ruling and sided with Campbell County** in its appeal of a lawsuit over groundwater contamination and a county landfill. In 2009, a jury awarded over \$9 million in damages to owners of a mobile-home park that was affected by groundwater contamination in 2002 from a county landfill that was closed in the 1990s. The owners had sued the county in 2005. The Supreme Court reversed the lower court ruling because, in the words of Supreme Court Chief Justice Cynthia Kinser, the Oil Discharge Law controlling oil spills "does not apply to the passive, gradual seepage of leachate and landfill gas into groundwater." Between 2005 and February 2010, the county spent an estimated \$3 million to install and monitor a groundwater-treatment system, and the county stated after the Supreme Court ruling it will continue its contaminant-remediation

efforts. By late January, the owners reportedly had begun the process of seeking a rehearing by the Virginia high court. (*Lynchburg News & Advance*, 9/13/11; 1/13/12; 1/20/12; 1/27/12)

● Here are some recent developments (as of late February 2012) over **groundwater contamination from coal combustion by-products** (1.5 million tons of fly ash) taken from Dominion Virginia Power's Deep Creek Power Plant and used in 2002 to construct the **Battlefield Golf Club's course in Chesapeake**. On February 21, lawyers for about 400 people living near the golf course filed a second lawsuit against Dominion, the golf course's owners, and two other parties, alleging that 10 people were damaged by groundwater contamination affecting residential wells and asking for \$2 billion in damages. A previous lawsuit was dismissed for insufficient evidence of damages from contamination. Meanwhile, also in February, a \$10-million lawsuit against Dominion and another party was filed by a contractor who alleges that his work with fly ash in building the golf course over five years contributed to his developing kidney cancer. (*Virginian-Pilot*, 2/22/12)

Here is some additional background on the situation and some previous developments:

1) Starting in 2002, some 1.5 million tons of ash from Dominion Virginia Power's Deep Creek Power Plant were used in building the golf course. Starting in March 2008, a series of *Virginian-Pilot* articles described the use of the ash and alleged impacts on nearby groundwater. In August 2008, Dominion offered to provide up to \$6 million to extend water-supply lines to the area near the golf course. In April 2010, the U.S. EPA reported that it had found no public-health threat from contaminants in the soil beneath the course. Since 2008, the EPA had paid a contractor to test 22 golf-course wells and 55 nearby residential wells. In those tests, arsenic, lead, and other contaminants were found in the golf-course test wells, but EPA concluded that these materials were not moving from the golf course to the residential wells. Lead had been found in some residential wells and the EPA offered to do further tests on those wells. Dominion is to continue monitoring the golf course wells four times annually, under oversight by the Virginia DEQ. (*Virginian-Pilot*, 4/23/10)

2) On March 16, 2011, CDM Engineering released a 600-page study confirming that groundwater under the golf course was contaminated with up to 10 toxic substances, but that the contamination had not reached residences near the course. (*Virginian-Pilot*, 3/17/11. For previous *Water Central* items, please see the May 2010 News Supplement, p. 7; and the June 2009 issue, p. 27.)

DEQ Reports on State's Water Quality

● On March 26, 2012, the Virginia DEQ released for public comment the **draft 2012 report on water quality in Virginia's streams, rivers, lakes, and estuaries**. The federal Clean Water Act requires such a report every two years. The 2012 report includes assessments of conditions in Virginia's waters based on data gathered from January 2005 to December 2010. Here are key findings from the draft 2012 report (numbers are subject to revision following public comment and review by the U.S. EPA).

1) Compared to the 2010 report (based on data from 2003-2008), this year's report adds about 840 miles of streams and rivers, 100 acres of lakes, and 2 square miles of estuaries to the impaired waters list, requiring the development of about 1,000 cleanup plans, in addition to an undetermined number of cleanup plans resulting from the 2012 listing.

2) The draft report removes from the impaired waters list about 260 miles of rivers and streams and 2,700 lake acres because they now fully meet water quality standards. The report also *partially* delists another 230 miles of rivers and streams and 4,060 lake acres for at least one impairment.

The "Draft 2012 305(b)/303(d) Water Quality Assessment Integrated Report" is available online at <http://www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2012305b303dIntegratedReport.aspx>. (Virginia DEQ News Release, March 26, 2012)

More Confluences Between Water and Energy

Water/Energy #1: Evaluation of Potential Uranium Mining Continues

● April 2012 saw two new developments on the **proposed uranium mining project in Pittsylvania County**. First, on April 4, members of Gov. Robert McDonnell's administration who are serving on an inter-agency Uranium Working Group met with representatives from municipalities and environmental groups to describe how the group intends to offer opportunities for public input to its work. Gov. McDonnell created the group in January 2012, at the same time that he called upon the 2012 Virginia General Assembly to take no action this year on whether or not to remove the Commonwealth's moratorium on uranium mining (in

place since 1982). The governor directed the study group to do a comprehensive study of the issue and to prepare a “draft statutory and conceptual regulatory framework that could be used to govern all aspects of mining and milling uranium in Virginia.” In the April 4 meeting, administration officials stated that the public would have opportunities to comment online, in correspondence, and at four public meetings. In the second development, on April 6 the governor stated that he intends to make no recommendations to the General Assembly on whether or not to remove the uranium-mining moratorium when he transmits the findings of the work group on to the legislature. (Virginia Governor’s Office News Release, 1/19/12; *Richmond Times-Dispatch*, 4/5/12; *Lynchburg News & Advance*, 4/5/12)

- In November 2011, the board of **Fairfax Water** authorized an **\$85,000 study of what impacts might occur** if the Virginia General Assembly lifts its moratorium on uranium mining and then if mining were to take place in the Potomac or Occoquan watersheds. It’s not known if there are economically viable uranium deposits in Fairfax Water’s service area. According to their Web site, <http://www.fcwa.org>, Fairfax Water is Virginia’s largest water utility, serving about 1.7 million people in the counties of Fairfax, Loudoun, and Prince William and the City of Alexandria. (*Washington Post*, 12/1/11)

- On December 19, 2011, the **National Academy of Sciences (NAS)** released “Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety and Regulatory Aspects of Uranium Mining and Processing in Virginia.” Over 300 pages, the report was prepared over the previous year by a 14-member panel, at the request of the Virginia Coal and Energy Commission. The report’s 11-page Non-technical Summary concluded the following: “If the Commonwealth ... removes the moratorium ... there are steep hurdles to be surmounted before mining and processing could be established in a way that is appropriately protective of the health and safety of workers, the public and the environment. [T]here exist internationally accepted best practices that could provide a starting point for the Commonwealth if it decides to lift its moratorium. ... [T]he committee is convinced that the adoption and rigorous implementation of such practices would be necessary if uranium mining, processing, and reclamation were to be undertaken.” The report is available at the National Academies Press Web site, at http://www.nap.edu/catalog.php?record_id=13266. (National Academy of Sciences News Release, 12/19/11)

Water/Energy #2: Virginia Still Pursuing Stake in Offshore Oil and Gas Exploration

- On November 8, 2011, U.S. Interior Secretary Kenneth Salazar announced the proposed **2012-2017 Offshore Oil and Gas Development Program**, which determines what offshore areas will be available for leases to explore for and develop petroleum and natural gas deposits. As the Interior Department had previously announced (in a December 2010 statement by Sec. Salazar), the proposed 2012-2017 program does *not* include **Lease Sale 220, a 2.9-million acre area off the coast of Virginia** (see figure at right). Prior to the Gulf of Mexico oil spill in 2010, Lease Sale 220 had been a priority area for exploration in 2011 or 2012. Virginia Gov. Robert McDonnell and U.S. Senators Mark Warner and James Webb called on President Obama to reconsider the postponement of leasing the area off Virginia. (*Richmond Times-Dispatch*, 5/6/11; *Virginian-Pilot*, 7/7/11 and 11/8/11; Virginia Governor’s Office News Release, 11/3/11)

- In March 2012, Secretary Salazar announced in Norfolk that a draft programmatic environmental impact statement was issued to allow for **seismic survey exploration** of available gas and oil resources in the Atlantic Ocean off of Virginia’s coast (Virginia Governor’s Office News Release, 11/3/11; 3/28/12)



Lease Sale 220 Area (in yellow), as of October 2010. Map from Bureau of Ocean Energy, Management, Regulation and Enforcement, <http://www.gomr.boemre.gov/homepg/lseale/220/mat1220.html>, accessed 5/8/12.

Water/Energy #3: Wind Energy Gets Some Go-aheads and One Setback

● On February 2, 2012, the U.S. Bureau of Ocean Energy Management announced that it had completed **environmental and safety assessments of certain potential offshore wind zones off the Atlantic Coast**, including offshore of the states of Virginia, Delaware, Maryland, and New Jersey. The assessments found that offshore wind projects in those zones would have “no significant environmental or socioeconomic impacts” on fisheries, military operations, marine traffic, or marine life. The area off Virginia’s coast covers 112,799 acres, 23.5 to 36.5 nautical miles east of Virginia Beach. Various companies, including Dominion Virginia Power, Apex Offshore Wind, and Seawind Renewable Energy Corporation, have expressed interest in developing projects off Virginia’s coast. (United States Department of Interior News Release, 2/2/12; *Richmond Times-Dispatch*, 2/3/12; *Virginian-Pilot*, 2/3/12)

● A **wind-energy prototype turbine** that was expected to be built off Virginia’s coast will apparently not proceed. On May 7, 2012, Gamesa Energy USA and Huntington Ingalls Newport News Shipbuilding announced that they had suspended work towards the five-megawatt prototype. The companies cited uncertain federal energy policy and possible ending of federal tax credits as reasons for suspending work on the project. This development followed the decision on March 27, 2012, by the Virginia Marine Resources Commission (VMRC) to approved construction of the turbine prototype in the Chesapeake Bay, about three miles offshore from the Northampton County town of Cape Charles. According to a news release at that time from the Virginia governor’s office, the project was intended to test new offshore technology developed by Gamesa, which has installed wind-energy projects in 30 countries. Sources: *Norfolk Virginian-Pilot*, 5/8/12; Virginia Governor’s Office News Release, 3/27/12.

Water/Energy #4: Natural Gas Remains Newsworthy

● An oversupply of natural gas in the United States—resulting to a large extent from many new gas wells in the Marcellus shale formation (see map at right)—is leading **Richmond, Va.-based Dominion Resources to pursue export of liquefied natural gas (LNG)** through its Cove Point terminal in the Chesapeake Bay off Calvert County, Maryland. As of February 2012, Dominion had received approval to export LNG to about 20 nations with which the United States has free-trade agreements, and the company was seeking federal approval for exporting to any nation except those under trade sanctions. If that approval is granted, Dominion would still need state and local permits to construct a facility at the terminal for liquefying natural gas. (*Baltimore Sun*, 2/10/12)

● In December 2011, the Carrizo LLC company of Houston, Texas, withdrew its application for a **local permit to use hydraulic fracturing (“fracking”) to drill for natural gas in the Bergton area of Rockingham County**. The area is underlain by part of the Marcellus shale formation. By April 2010, Carrizo had met all requirements for the Virginia Department of Mines, Minerals and Energy to issue a *state* permit for drilling a maximum 3,700-foot exploration well. But the Rockingham County Board of Supervisors tabled the company’s special-use permit request on February 24, 2010, in order to gather more information about the exploratory drilling process and its potential environmental impacts. Carrizo eventually withdrew its application in the face of local opposition and concerns about the potential impacts of the drilling on groundwater and local roads. (*Harrisonburg Daily News-Record*, 4/28/10; *Washington Post*, 2/5/12)



Marcellus shale distribution. Map by American Association of Petroleum Geologists, provided courtesy of Virginia Department of Mines, Minerals and Energy.

●As of February 2012, Virginia-based EcoCorp was seeking local permits in Princess Anne County, Maryland, for a **facility to convert carbon compounds in poultry litter to methane**. The one-megawatt plant would produce liquid fertilizer as a by-product. The company has plans for 25 such facilities throughout the Delmarva Peninsula, using about 200,000 of the 700,000-800,000 tons of litter produced annually in the area. (*County (Md.) Times*, 2/16/12)

Water/Energy #5: Coal—The Old Standby Facing Challenges

●In December 2011, the U.S. EPA issued the Mercury and Air Toxics Standards, **regulations setting limits for power plants' (particularly coal- and oil-fired power plants') air-emissions of mercury, arsenic, acid gas, nickel, selenium, cyanide, and other toxic substances**. The new standards—the first ever issued for these emissions from power plants—derive from amendments in 1990 to the federal Clean Air Act. The EPA estimates that over half of existing power plants have already installed technology to meet the new standards, so that the standards will primarily affect about 40 percent of existing coal-fired plants. Plants will have four years to meet the new standards. These regulations, combined with the Cross-State Air Pollution Rule (also published by the EPA in 2011), are expected to result in closure of about 32 older power plants, with the potential to result in closure of over 30 others. EPA documents on this regulation are available online at <http://www.epa.gov/mats/actions.html>. (Associated Press, 12/19/11; U.S. EPA News Release, 12/21/11; *Washington Post*, 12/22/11)

●In another development on air emissions that can affect water resources, in March 2012 the U.S. EPA issued the draft “**Carbon Pollution Standard for Future Power Plants**,” proposing limits to carbon emissions from new power plants. If finalized, the standards would limit emissions to no more than 1000 pounds of carbon per megawatt generated. The EPA held public hearings on the proposed regulation on May 24 in Washington, D.C., and Chicago, and the public comment period on the proposal runs until June 25. More information on the proposed regulation is available online at <http://epa.gov/carbonpollutionstandard/actions.html>.)

One significant Virginia impact of the proposed regulation is that it **puts into question the future of Old Dominion Electric Cooperative's (ODEC's) proposed coal-fired Cypress Creek power plant in Surry County**. On March 5, 2012, the Dendron Town Council voted for a second time to approve local permits for the proposed \$5-billion, 1,500-megawatt plant, which would be the largest coal-fired plant in Virginia. The council's second vote of approval (the first had come in February 2010) followed a successful lawsuit challenging the public-notice procedures of the council's February 2010 vote to approve local permits (many other state and federal permits are still needed before construction on the plant could begin). But the plant—as designed now—would emit an estimated 1700 pounds per megawatt-hour generated, exceeding the proposed standard. The March 29, 2012, *Virginian-Pilot*, quoted David Hudgins, ODEC's director of external relations, as saying that ODEC's board would not approve the additional expense of technology to meet the proposed standards “with all this regulatory uncertainty in the air.” *Virginian-Pilot*, 3/7/12; 3/29/12; [EPA Proposes First Carbon Pollution Standard for Future Power Plants](#), U.S. EPA News Release, 3/27/12. For a previous Water Central item on the proposed Surry plant, please see the May 2010 issue News Supplement, p.7.)

Water/Energy #6: Possible Expansion at North Anna Nuclear Power Station

●In December 2011, Dominion Virginia Power applied to the State Water Control Board (SWCB) for a **permit to raise the level of Lake Anna three inches** in order to allow an additional daily withdrawal of up to about 32 million gallons of to cool Dominion's planned third reactor at the North Anna Nuclear Power Station. Dominion applied to the Nuclear Regulatory Commission for permission to build a third reactor, although the company has not stated that it definitely plans to do so if permits are granted. Lake Anna was built in 1972 to provide cooling water for the nuclear plant. The permit application includes a proposed purchase by Dominion of credits from a wetlands mitigation bank to compensate for potential shoreline wetlands damage from the water-level rise. A public hearing on the request was held on January 18 in Mineral (Louisa County), and the SWCB approved the permit application at its April 5 meeting. (*Fredericksburg Free Lance-Star*, 12/15/11; State Water Control Board April 5, 2012, meeting agenda and minutes, available online at <http://www.townhall.state.va.us/L/ViewMeeting.cfm?Meetingid=17813>)

Water Views 2011-2012



Dam and lake at Hungry Mother State Park in Smyth County, 2/6/11.



Covington River at Rediviva in Rappahannock County, 2/27/11.



Lake Abbott and Sharp Top Mountain at Peaks of Otter in Bedford County, 4/21/11.



Water cascades over travertine (calcium carbonate deposits) at Falls Ridge in Montgomery County, 5/8/11.



South River in Rockbridge County, 7/30/11.



St. Mary's River in Augusta County, 7/30/11.



Potomac River from Fairview Beach
in King George County, 8/12/11



Stony Creek along Rt. 635
in Giles County, 9/17/11.



Snow for Halloween near Bluemont
in Loudoun County, 10/30/11.



New River at Narrows in Giles County, 11/6/11.



Pond along U.S. Rt. 55
in Shenandoah County, 12/30/11.



Moormans River on Rt. 671 near Millington
in Albemarle County, 5/8/12.

SCIENCE BEHIND THE NEWS

Trees and Water (Part 1)

By Sanglin Lee and Alan Raflo.

Sanglin Lee, a May 2012 graduate from Virginia Tech's English Department, was an intern at the Virginia Water Resources Research Center during the Fall 2011 semester. The authors thank Carlos Evia of the Virginia Tech Department of English, Jennifer Gagnon of the Virginia Tech Department of Forest Resources and Environmental Conservation, and Kevin McGuire of the Virginia Water Resources Research Center for their assistance with this article.

All Web sites listed were functional as of 5/15/12.

Extra! Extra! Read All About It: Trees Affecting our Community and Beyond

"We All Benefit From Trees, But How Much?" *Conservation Currents, Northern Virginia Soil and Water Conservation District*, Summer 2011

"Nationwide Insurance Joins with American Forests to Support Poultry Farm Tree Plantings," *Delmarva Poultry Industry News Release*, 5/3/10

"Trees and Shrubs Help Filter the [Chesapeake] Bay," *Newport News Daily Press*, 4/2/09

"A Natural Solution: Trees Planted to Remove Pollution from Streams," *Staunton News Leader*, 11/6/08

"The Forgotten Forest Product: Water!," *New York Times*, 1/3/03

Introduction

Since at least the late 1800s, scientists and forest managers in the United States have recognized that forests have strong influences on water resources.¹ Today the connections between forests and water are widely reported in the news media (as shown by the headlines above), promoted by natural resource agencies, and investigated by specialists such as **hydrologists**, **dendrologists**,² foresters, forest biologists, and water managers. Tree structures and functions influence at least four major areas of water-resources concerns: water quality; aquatic habitat; water quantity; and the interactions among water, climate, and energy use. In this article, we seek to give readers a basic introduction to Virginia's trees and a foundation for assessing the interesting and complicated connections between water and trees. [Ed. note: *Water Central* plans one or more future articles that will examine trees' connections to specific aspects of water resources.]

Some Tree Basics

Trees, shrubs, and some vines are distinctive among plants in that they produce woody structures. According to the National Park Service and U.S. Department of the Interior, the difference between trees and shrubs is that trees usually grow over twenty feet tall and have trunks that are at least two inches in diameter and rise above four and a half feet above ground. Shrubs, on the other hand, are smaller than trees and start splitting into smaller stems near the ground. Under certain environmental conditions,

¹ J.D. Hewlett, *Principles of Forest Hydrology* (Athens: University of Georgia Press, 1969), pp. 4-5.

² The science of **hydrology** seeks to understand, describe, and predict water movement over and below the land surface, in water bodies, and in the atmosphere—movement collectively referred to as the hydrologic cycle (or water cycle) (for more on the science of hydrology, please see the Dec. 1998 *Water Central*, p. 7. **Dendrology** is the scientific study of the identification, classification, distribution, and general growth habits of trees and other woody plants.

however, some trees may grow more like shrubs (with multiple stems and lower height).

Along with other plants that reproduce by seeds (many plants reproduce by spores, not seeds), trees are classified into two large groups, based on whether or not they produce flowers. **Angiosperms** are flowering plants, with their seeds enclosed within fruits that develop from the flowers; oaks, hickories, and maples are all angiosperms. **Gymnosperms**, on the other hand, do not have flowers; their seeds are not enclosed in a fruit (the term means "naked seeds") but are typically borne on cones, so most gymnosperms can also be called **conifers** (cone-bearing trees); pines, spruces, and firs are gymnosperms and conifers.

Most deciduous trees (those that shed all their leaves in autumn) are flowering plants, and *most evergreen* trees (which *do* lose their leaves but not all of them at once in a given season) are gymnosperms; there are, of course, exceptions, and the photos below show two. According to *Forest Biology Textbook* by J. R. Seiler et al. "deciduous, flowering trees often are referred to as hardwoods and evergreen conifers as softwoods, because conifers' wood, with some exceptions, is typically lighter and softer than wood from deciduous trees." Finally, flowering trees are often called **broadleaf** trees, because their leaves are relatively wider than the *needles* found on many conifers. The following chart organizes the bold-faced terms for the two main tree types.

Angiosperms (flowers, with seeds within fruits)	Gymnosperms (no flowers, with seeds on cones)
Usually deciduous	Usually evergreen
Known as hardwoods	Known as softwoods
Broad leaves	Needle-like or scale-like leaves
Familiar examples: hickories, maples, oaks	Familiar examples: firs, spruces, pines



Exceptions to the Evergreen "Rules":

Bald Cypress, photographed in December 2006 at a spring in Leesburg, Va., is a *non-evergreen* (deciduous) conifer.

American Holly, photographed in December 2008 at a pond in Blacksburg, Va., is a flowering evergreen tree.

Several hundred species of trees are found in North America. These trees are either native to this continent or **naturalized**, that is, originating in some other area but having become widespread and capable of reproducing outside of cultivation. Each species has a **range**, or the broad area in which temperature, rainfall, and other environmental conditions allow the species to grow and reproduce. Of course, planted individuals can be found far outside of a species' native range; for example, the Rocky Mountain native Blue Spruce is often planted in Virginia. Within their native ranges, certain tree species typically occur together in identifiable **forest types**. The National Wildlife Federation's (NWF) *Field Guide to Trees*, for example, lists 15 forest types that naturally occur in the United States (excluding Hawaii), ranging from the boreal

forests of Canada and Alaska to the southeastern coastal plains forests of the Atlantic coast. The next section looks more closely at the kinds of forests and trees found in Virginia.

Trees and Forests in Virginia

The *National Wildlife Federation Field Guide to Trees of North America* (Kershner et al., 2008, p. 18) describes three main forest types found in Virginia. First is the **eastern deciduous forest**, characterized by high diversity of mostly deciduous species (perhaps 200 native species) with relatively few conifers. Second is the **southern oak-hickory-pine forest**, widely occurring in the Piedmont areas of southeastern states and differing from the eastern deciduous forest by having more types and more abundance of pines. Third is the **southern coastal plains forest** which is characterized by pines in upland areas with deciduous trees along waterways and in other low, moist areas.

According to the *2010 State of the Forest* report from the Virginia Department of Forestry (VDOF), in 2008 about 15.7 million acres of Virginia, or about 62 percent of the state, were classified as **forest land**, defined as “land at least 10 percent stocked by forest trees of any size, or formerly having such tree cover, and not currently developed for non-forest use” (p. 4). Of these forest-land acres, 78 percent (12 million acres) were hardwood or hardwood-pine forests (mostly oak-hickory forests), and 20 percent (three million acres) were pine forests (with over 50 percent of the pine acres in managed pine “plantations”). Bottomland hardwood forests occupied four percent of Virginia land in 2007, and deciduous forests dominated by maples, American Beech, and birches occupied two percent.

The annual VDOF report identifies the most common Virginia trees in two ways: by estimates of the number of individual trees and by estimates of the volume occupied (in cubic feet). The table below shows the top ten Virginia trees by number and by volume in 2010.

Top Ten Virginia Trees by Number (2010)	Top Ten Virginia Trees by Volume (2010)
Red Maple	Yellow-Poplar
Loblolly Pine	Loblolly Pine
Yellow-Poplar	Chestnut Oak
Sweetgum	White Oak
Blackgum	Red Maple
Virginia Pine	Northern Red Oak
American Holly	Virginia Pine
White Oak	Sweetgum
Chestnut Oak	Scarlet Oak
Flowering Dogwood	Black Oak

Source: Virginia Department of Forestry, *2010 State of the Forest*, p. 7.

VDOF's 2010 report noted that several native Virginia trees are suffering substantial decline due to insect infestations, disease, or other problems. Along with traditional pests such as Gypsy Moth and Southern Pine Beetle, more recent threats include the Emerald Ash Borer, Thousand Cankers Black Walnut Disease, and various non-native invasive weeds. In general, invasive species remain the most significant threat to forest health, according to VDOF.

Water is an important factor in how trees respond to these threats. Effects on trees from insect pests and diseases can be more severe if trees are already stressed by inadequate water. In turn, the consequences of drought magnify the negative impacts on trees that are already suffering from insects or diseases. VDOF reported that the wave of Gypsy Moth outbreaks that occurred during the drought between 2005 and 2008 resulted in 114,000 acres of severe defoliation in 2008. The lack of water combined with high temperatures contributed to the death of many trees that were already stressed by insects. According to the VDOF, the Gypsy Moth numbers were much reduced after the excessively wet spring and summer of 2009, which allowed a naturally occurring virus to take over and subdue the moth population, including a steady decline in 2010 and 2011.

But, of course, water is important to trees in many ways, not just in response to insects and diseases. The next section looks at some basic aspects of water relations in trees.

Water's Influences on Trees

Like all living things (except viruses), trees are made up of cells that consist largely of water. According to Seiler et al.'s *Forest Biology Textbook*, water makes up as much as 90 percent of the leaves and other tree tissues during periods of growth. With water making up a large percentage of a tree, the availability of water is crucial to a tree's ability to grow as it affects cell division and stem elongation. Like other living things, water in tree cells provides a **solvent** (a substance in which other materials can dissolve) to contain and transport the many substances needed for biochemical reactions.³ Water is itself involved in many of these reactions, particularly in **photosynthesis**, the process whereby green plants convert light energy into carbon-based chemical energy (or "food"). When plants absorb carbon through leaves for photosynthesis, they also lose water at the same time. This tradeoff between carbon and water drives the plant's circulatory system and cools plant leaves through vaporization where heat energy is released to the environment. Water in trees and other plants (but not in animals) is also needed to maintain pressure in cells that supports leaves and other non-woody plant parts; without sufficient pressure from water, plant cells lose the structure needed to function properly. Wilting is a common response to inadequate water pressure in plant leaves or stems; the accompanying photo shows an example of wilting.



Rhododendron leaves wilting under dry conditions in Giles Co., Va., in January 2009.

Once a tree's roots absorb water, other structures in the tree combine with certain physical properties of water allow trees to move water and dissolved substances throughout the tree. Water molecules, which tend to stick to other water molecules, are absorbed by the roots and pulled through thin tubes inside the tree into stems and leaves. This is known as **capillary action**. Water properties of tension and cohesion determine movement of water up trees. Water also influences cell division and stem elongation in trees.

As noted above, water, along with temperature and other environmental conditions, is a key factor in determining the range of tree species; that is, the broad geographic area where a tree species exists. A Sugar Maple, for example, could never survive in the southwestern U.S. deserts, where species of mesquite trees live. But water availability is also a key factor in determining tree **distribution**—that is, where *within* the range one actually finds populations of a given species. Areas in Virginia range from being consistently wet, such as wetlands found throughout the state but particularly along in Tidewater, to relatively dry south-facing mountain slopes in western Virginia. While trees are found in all of these conditions, some require really wet or really dry conditions in order to survive. Others have preferred conditions but can survive in a wide variety of circumstances. Following are some examples of how tree distribution is related to water condition, using various species from the VDOF Top Ten Virginia Trees and other trees from their related groups. The information and quotes in these examples are from Virginia Department of Forestry's *Common Native Trees of Virginia Tree Identification Guide*, and the Virginia Tech Department of Forest Resources and Environmental Conservation's "Tree Identification Factsheet," available at http://dendro.cnre.vt.edu/dendrology/data_results_with_common.cfm?state=unknown#. The scientific name of each tree is provided at the end of this article.

1. Pines

Virginia Pine can be found throughout the state in dry conditions, and definitely would not be found in wetlands. On the other hand, Pond Pine is normally found within a limited area in southeastern Virginia and can only grow in moist sites.

³ Water-based solutions are the transport medium both within cells and between cells throughout a tree; rising sap in the spring, for example, brings nutrients dissolved in water from roots to newly growing cells in leaves and stems.

2. Maples

Silver Maple is commonly found in the Appalachian region and along the southern border of the state. Silver Maple grows better in wetter conditions, so native trees are most commonly found along stream banks, flood plains, and lake edges. Like the Silver Maple, Sugar Maple is also commonly found in the Ridge and Valley and Appalachian Plateau regions. But unlike the Silver Maple, Sugar Maple thrives in “moist but well-drained soils,” which is why it would not typically be found on river bottoms. A third example, Red Maple is different from the other two in that it is naturally found across Virginia and can live in a wide variety of sites, from very dry to wet conditions. These three and other species of maple are found planted (not occurring naturally) in all parts of Virginia, including regions outside of their natural habitat.

3. Blackgum and Water Tupelo

Blackgum also known as Black Tupelo, is found throughout Virginia and can live in a wide range of conditions from very wet to relatively dry conditions. In contrast, Water Tupelo is found in a very limited area of the state, mostly on the coast of the southern border of the state. According to the *Common Native Trees of Virginia*, its natural habitat is near water, such as in “deep river and coastal swamps” (p. 93).

4. Oaks

Twenty-six species of oaks are native to Virginia. Several of these oaks are on the 2010 list of “Top Ten Virginia Trees by Volume.” This diversity of species of oaks shows a variety of preferences and tolerances for water conditions among trees in the same genus. Post Oak, for example, can be found throughout most of the state, but needs “rocky and sandy ridges or dry woodlands” to thrive. In contrast, Water Oak is commonly found only in the southeast coastal areas of Virginia along waterways such as streams and swamps. Other oak species respond to water in more subtle ways, such as growing on various parts of a slope of a mountain. Northern Red Oak is found throughout the state but it thrives in “well-drained soils and fertile coves, and reaches best growth on north and east slopes—in cooler, moister areas.” In contrast, Scarlet Oak would typically be found on drier, rockier parts of mountain slopes.

Trees Providing Direction

In recent years, Virginians who follow news about water, the environment, or their local community may have seen headlines highlighting trees and water in the news. Streamside hikers may have seen dozens or hundreds of plastic tubes staked in the ground, indicating newly planted trees intended to help improve stream water quality and habitat. Cities are encouraging planting of trees to help reduce stormwater runoff and the pollutants it can carry to waterways. Travelers booking flights online may have been asked if they wish to offset their carbon footprint by making a contribution to help plant trees that will absorb the greenhouse gas carbon dioxide and store it in tree structures.

In these and other ways, trees are being recognized as part of the solution for an array of issues connected to water. Virginia has a rich diversity of tree species that both are influenced by water conditions and in turn affect the quality and quantity of water around them. Increasing one's awareness of this resource and its water relationships will help provide direction for public and private decisions that will affect our landscapes, our communities, and ourselves.



A tree sign points the way to water along the Appalachian Trail in Washington County, Va., December 2008.

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Additional Resource

The **National Tree Benefit Calculator** is an interesting resource that can be used for figuring out the impact and contribution the trees in your neighborhood are making regarding property value, energy, stormwater, and air quality. This Benefit Calculator can be found at <http://www.treebenefits.com/calculator/index.cfm>.

Scientific Names of Trees Mentioned

Blackgum - *Nyssa sylvatica*
 Northern Red Oak - *Quercus rubra*
 Pond Pine - *Pinus serotina*
 Post Oak - *Quercus stellata*
 Red Maple - *Acer rubrum*
 Scarlet Oak - *Quercus coccinea*
 Silver Maple - *Acer saccharinum*
 Sugar Maple - *Acer saccharum*
 Virginia Pine - *Pinus virginiana*
 Water Oak - *Quercus nigra*
 Water Tupelo - *Nyssa aquatic*



Twin trees at Lake Abbott at the Peaks of Otter in Bedford County, Va., April 2011.

VIRGINIA WATER STATUS REPORT

This section of Water Central presents recent and historical data on Virginia's precipitation, groundwater levels, stream flow, and occurrence of drought conditions.

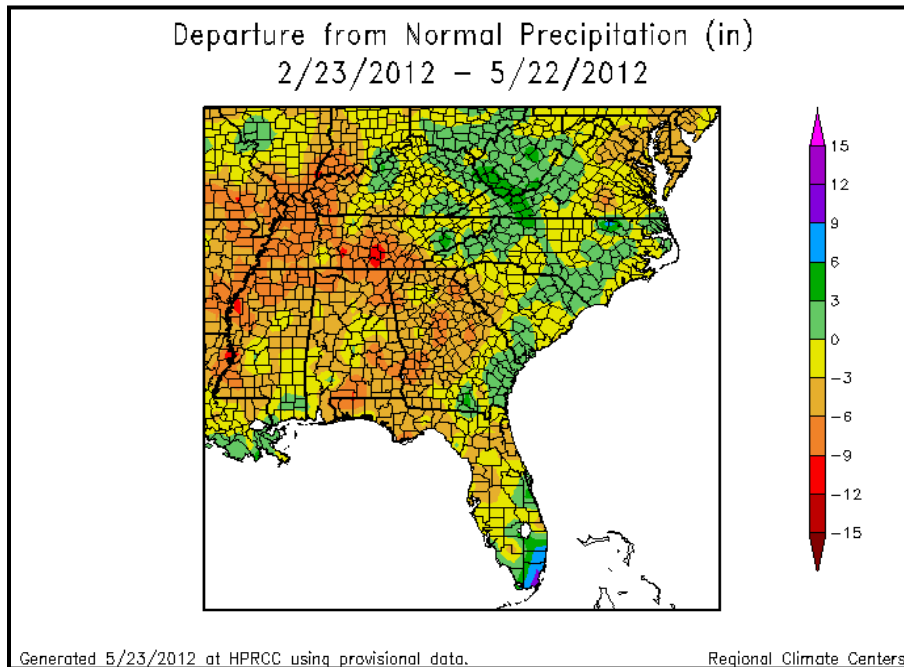
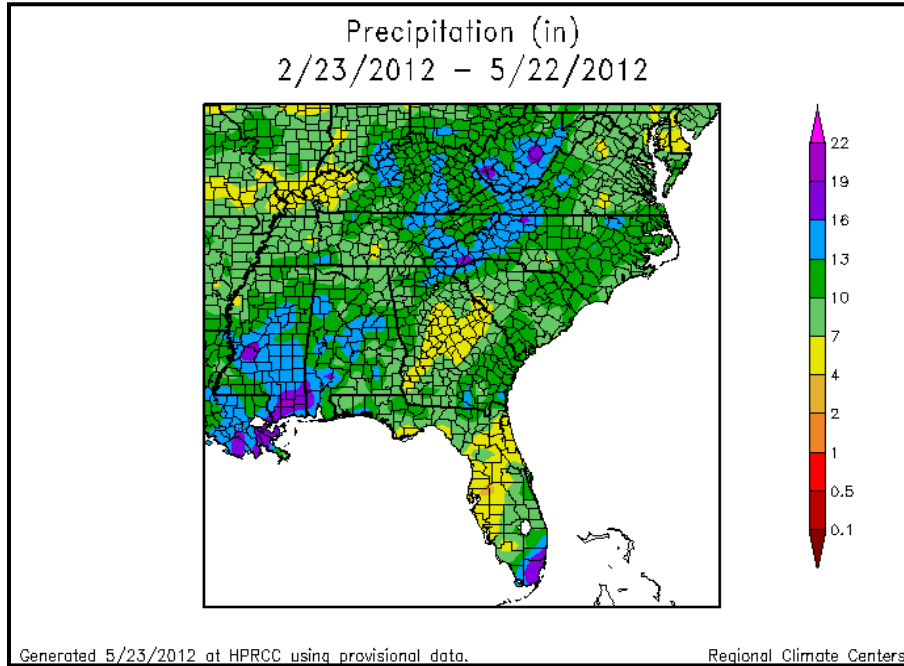
Precipitation in Virginia, May 2011-April 2012

The chart below shows precipitation (in inches) over the last 12 months at eight National Weather Service (NWS) observation sites in or near Virginia. The numbers in the rows marked "O" are **observed precipitation** for the respective site and month (with yearly total at the bottom of the chart), including the equivalent amount of water contained in any snowfall or other frozen precipitation. These values were found at the "Climate" sections of NWS Web sites, as follows: www.weather.gov/climate/index.php?wfo=mrx for the Tri-cities Airport in Tennessee, about 20 miles from Bristol, Va.; www.weather.gov/climate/index.php?wfo=rnk, for Blacksburg, Danville, Lynchburg, and Roanoke; www.weather.gov/climate/index.php?wfo=lwx, for Washington-Dulles; and <http://mi.nws.noaa.gov/climate/index.php?wfo=akq>, for Norfolk and Richmond. The number in the rows marked "N" (in red) are the **normal (average) precipitation** for the locality and month used by the NWS Web sites. Please note that as of 5/23/12 the May-July normals at NWS sites were based on 1971-2000 records, and the Aug.-Apr. normals were based on 1981-2010 records that were released from the National Climatic Data Center (NCDC) in 2011 (<http://www.ncdc.noaa.gov/oa/climate/normal/usnormals.html>). The amounts listed here are classified by the NWS as *provisional* data and are subject to revision; the NCDC maintains any edited and *certified* data that are available.

	Bristol (Tri-Cities Airport)	Blacks- burg (VT Airport)	Danville (Station #37)	Lynchburg (Regional Airport)	Norfolk (Internat. Airport)	Richmond (Byrd Intern. Airport)	Roanoke (Woodrum Airport)	Wash.- Dulles Airport
May11 O	5.93	7.32	5.33	3.33	1.95	4.35	3.79	3.28
May N	4.32	4.39	3.96	4.11	3.74	3.96	4.24	4.22
Jun11 O	3.40	2.78	1.56	3.81	4.63	3.03	3.51	1.40
Jun N	3.89	3.93	3.50	3.79	3.77	3.54	3.68	4.07
Jul11 O	3.85	3.78	3.88	2.99	10.89	3.63	3.76	2.58
Jul N	4.21	4.17	4.44	4.39	5.17	4.67	4.00	3.57
Aug11 O	2.47	1.25	1.47	2.06	10.79	7.10	1.45	3.74
Aug N	3.47	3.59	3.97	3.26	5.52	4.66	3.56	3.53
Sep11 O	3.14	4.92	5.52	4.49	7.26	8.95	7.39	7.93
Sep N	2.99	3.10	3.96	3.88	4.76	4.13	3.89	3.92
Oct 11 O	2.84	2.94	3.45	2.95	2.13	2.79	4.06	6.27
Oct N	2.10	2.78	3.53	3.11	3.42	2.98	2.89	3.25
Nov11 O	4.60	3.70	4.98	3.27	1.84	4.18	4.30	2.18
Nov N	3.10	2.87	3.36	3.41	3.15	3.24	3.40	3.41
Dec11 O	4.10	3.62	2.19	4.61	1.56	2.03	4.19	4.46
Dec N	3.37	2.95	3.27	3.24	3.26	3.26	2.94	2.96
Jan12 O	4.60	2.09	1.99	2.22	1.80	1.73	1.69	1.85
Jan N	3.37	3.08	3.42	3.14	3.40	3.04	2.92	2.68
Feb12 O	3.71	3.52	2.12	2.61	2.67	3.22	2.21	2.24
Feb N	3.45	2.81	3.01	2.93	3.12	2.76	2.89	2.74
Mar12 O	2.58	3.84	3.55	5.78	2.62	2.51	3.52	1.52
Mar N	3.44	3.64	4.11	3.58	3.68	4.04	3.46	3.38
Apr12 O	3.83	4.81	2.76	2.44	2.95	2.40	3.04	1.82
Apr N	3.33	3.48	3.46	3.31	3.41	3.27	3.37	3.47
TOTAL O	45.05	44.57	38.80	40.56	51.09	45.92	42.91	39.27
TOTAL N	41.04	40.79	43.99	42.15	46.40	43.55	41.24	42.70

Precipitation, continued: Regional Precipitation Late February-Late May 2012

For a more visual presentation over a wider area, the two graphs below—from the National Oceanic and Atmospheric Administration's (NOAA) Southeast Regional Climate Center, located at the University of North Carolina in Chapel Hill—show the total precipitation (in inches; top graph) for February 23-May 22, 2012, and the departure from normal (in inches above or below normal; bottom graph) over that period. Note that the values represented by a given color differ between the two graphs. *These data are provisional.* These graphs were taken from http://www.sercc.com/climateinfo/precip_maps on 5/23/12.



More Virginia climate information and data are available from the University of Virginia Climatology Office, online at <http://climate.virginia.edu>. To contact the office in Charlottesville, phone (434) 924-0548 or send e-mail to climate@virginia.edu.

Groundwater Levels at Selected Virginia Wells, May 2011

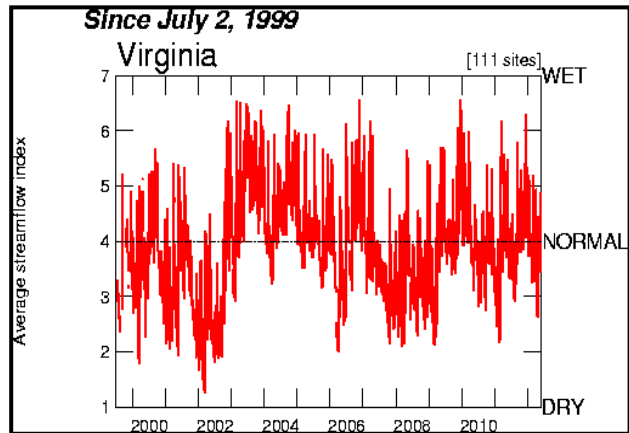
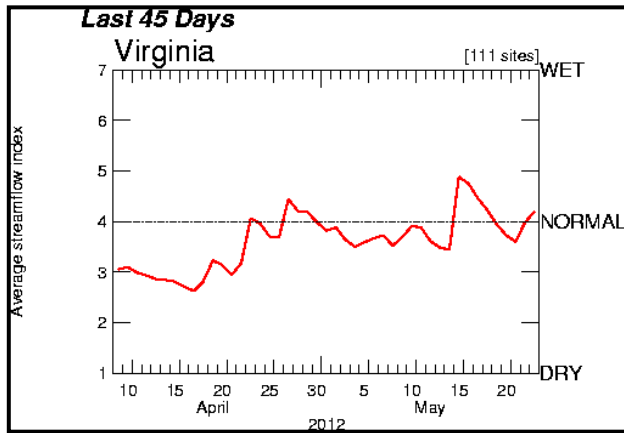
As of May 23, 2012, the Virginia Active Water Level Network—maintained by the U.S. Geological Survey (USGS) and available online at <http://groundwaterwatch.usgs.gov/StateMaps/VA.html>—provided access to groundwater levels at 494 active wells in 63 Virginia counties and cities. At 119 of these observation wells in 40 localities, *real-time data* (updated every 5 to 60 minutes) were being recorded. The table below shows the May 22, 2012 (except as noted) daily level from real-time wells in 19 localities. These readings are *provisional* (i.e., subject to revision). All measurements are in **feet below the land surface**, rounded to the nearest 0.1 foot; **a smaller value means wetter conditions, while a larger value means drier conditions**. The table also shows levels reported in previous issues of *Water Central*, plus the median level for the current month, the deepest (driest) level, and the shallowest (wettest) level for each well's period of record. Historical information on groundwater is also available from USGS annual reports of groundwater, available online at <http://wdr.water.usgs.gov/> for years 2002 to 2011; for previous years, check your local library for printed copies of the reports.

Well (Local #)	5/22/12 Level	1/10/12 Level	8/9/11 Level	May Median	Record Deepest (Driest)	Record Shallowest (Wettest)	Period of Record
Accomack (66M19SOW110S)	9.1	9.6	10.9	9.0	11.3 (Nov. 1981)	6.8 (Mar. 2010)	Since Sep. 1978
Buckingham (41H 3)	24.0	24.7	25.1	20.4	36.4 (Oct. 2002)	7.4 (Apr. 1973)	Since Mar. 1971
Clarke (46W 175)	39.4	37.4	36.0	36.2	45.7 (Sep. 2002)	23.5 (Sep. 2003)	Since Mar. 1987
Fairfax (52V 2D)	13.4	12.3	16.4	11.3	24.9 (Dec. 1998)	6.5 (Mar. 1984)	Since Oct. 1976
Hanover (53K 19 SOW 080)	16.3	15.7	19.9	16.9	22.9 (Aug. 1984)	5.1 (Aug. 2004)	Since Jan. 1978
Loudoun (49Y 1 SOW 022)	58.8	58.6	60.2	58.3	62.0 (Feb. 2008)	48.0 (June 1972)	Since Nov. 1963
Montgomery (27F 2 SOW 019)	4.2	3.4	4.2	4.0	7.3 (Dec. 1969)	< 0.0 (Mar. 1993)	Since Jul. 1953
Northampton (63H 6 SOW 103A)	8.1	8.2	8.0	5.6	10.0 (Oct. 2002)	0.8 (Aug. 2004)	Since Sep. 1977
Orange (45P 1 SOW 030)	26.4	22.3	28.7	21.8	39.0 (Aug. 2002)	11.8 (Apr. 1973)	Since Feb. 1965
Prince William (49V 1)	9.4	8.6	10.9	9.1	15.4 (Jul. 2011)	6.5 (Mar. 2010)	Since Nov. 1968
Roanoke City (31G 1 SOW 008)	18.8	18.8	19.0	18.5	19.3 (Jun. 1987)	12.4 (Feb. 1986)	Since Aug. 1966
Rockbridge (35K 1 SOW 063)	21.4	23.3	26.5	23.1	30.4 (Sep. 2002)	14.3 (Apr. 1987)	Since Feb. 1964
Rockingham (41Q 1)	67.6	69.9	71.7	67.0	99.0 (Oct. 2002)	57.7 (Feb. 1998)	Since Aug. 1970
Shenandoah ⁴ (40U 3 SOW 218)	14.0	14.1	15.0	13.6	16.3 (Oct. 2009)	10.6 (May 2011)	Since Oct. 2006
Suffolk (58B 13)	9.8	9.7	12.2	8.2	13.4 (Jan. 1981)	2.0 (Sep. 1999)	Since Mar. 1975
Surry (57E 13 SOW 094C)	9.2	8.2	8.0	7.7	11.3 (Sep. 2010)	3.9 (May 1980)	Since Jul. 1978
Virginia Beach (62B 1 SOW 098A)	1.8	2.7	5.9	3.2	12.0 (Sep. 1980)	0.8 (Nov. 2009)	Since Jun. 1979
Westmoreland (55P 9)	2.3	1.4 (11/5/11)	8.2	1.5	12.8 (Dec. 1988)	< 0.0 (Dec. 2009)	Since Jul. 1977
York (59F 74 SOW184C)	7.8	9.0	9.1	5.8	14.1 (Jan. 2002)	0.9 (Nov. 2006)	Since Jun. 1990

⁴ The Shenandoah County well has been included in this table only since the May 2010 issue of *Water Central*. Previously *Water Central* used Frederick County well 46X 110, but data collection was discontinued at that well in November 2009.

Stream Flow in Virginia: April-May 2012, and 1999-2012

Average Daily Stream Flow Index, Compared to the Historical Average for the Date



The graphs above, from the U.S. Geological Survey's (USGS) "WaterWatch—Current Water Resources Conditions" Web site (<http://water.usgs.gov/waterwatch/?m=real&r=va&w=real%2Cplot>, 5/23/12), compare recent Virginia stream flow to historical records.

The data in the graphs come from 111 sites that have at least 30 years of records. Each graph uses a "stream flow index," which measures how a site's average stream flow over 24 hours (the average daily stream flow) compares to the historical average stream flow for that same site and date. The graphs show a further average: the stream flow index averaged over all monitoring stations.

Index values (1-7 on the vertical axis in the graphs) mean the following:

Values indicating dry conditions:

- 1 = average daily flow is record low for that date;
- 2 = average daily flow is in the lowest 10 percent of historical values for that date;
- 3 = average daily flow is in the lowest 25 percent of historical values for that date, but exceeds the lowest 10 percent.

Value indicating "normal" flow:

- 4 = average daily flow exceeds the lowest 25 percent of historical values for that date, but is less than the highest 25 percent of values.

Values indicating wet conditions:

- 5 = average daily flow exceeds 75 of historical values for the date, but is lower than the highest 10 percent of values.
- 6 = average daily flow exceeds 90 percent of historical values for that date;
- 7 = average daily flow is record high for that date.

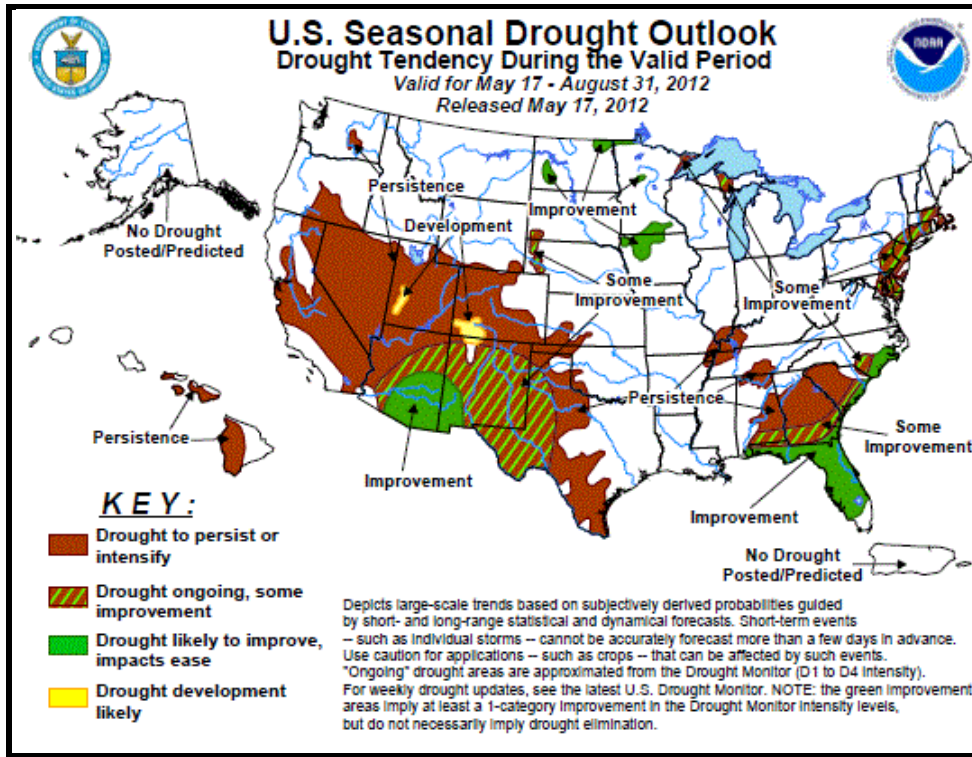
Gaps in the data: Data are not plotted for days when less than two-thirds of the sites report data (due to equipment or weather problems), because a statewide average on those days may misrepresent actual conditions.

The USGS WaterWatch site, at <http://water.usgs.gov/waterwatch/?m=real&r=va>, also has a maps of stream flow conditions compared to historical records for current levels and for average levels over the previous 1 day, 7 days, 14 days, 28 days, and month.



Stream-gaging station on North Fork Catoctin Creek near Waterford in Loudoun County, 6/25/10.

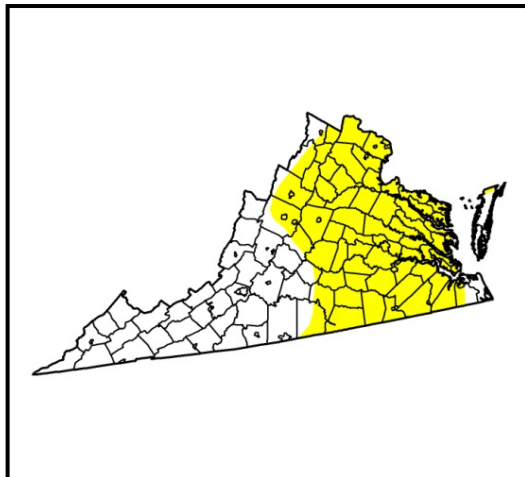
Drought Update



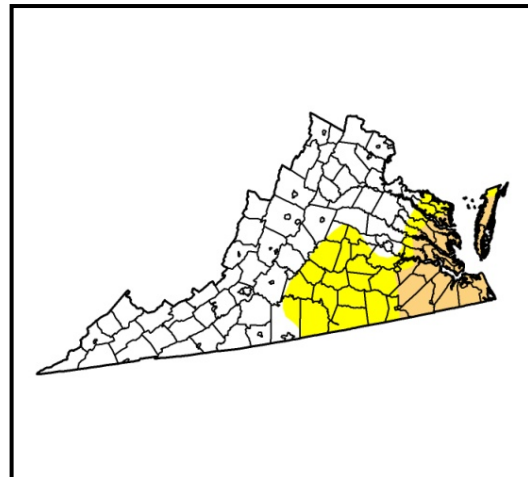
The national drought outlook for May-August 2012, according to the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center Web site, www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html, accessed 5/23/12.

From the U.S. Drought Monitor: Virginia Conditions Now and One Year Ago

The U.S. Drought Monitor, available online at www.drought.unl.edu/dm/monitor.html, is a weekly nationwide drought assessment by federal agencies and state climatological centers. The following graphs show Drought Monitor assessments of Virginia conditions on May 15, 2012, compared to May 17, 2011.



May 15, 2012



May 17, 2011

= D0 Abnormally Dry
 = D1 Moderate Drought
 = D2 Severe Drought
 = D3 Extreme Drought
 = D4 Exceptional Drought

Source: Images taken from archive of U.S. Drought Monitor, www.drought.unl.edu/dm/archive.html, 5/23/12. Authors: Brad Rippey, USDA, for 5/15/12 map; David Miskus, NOAA, for 5/17/11 map.

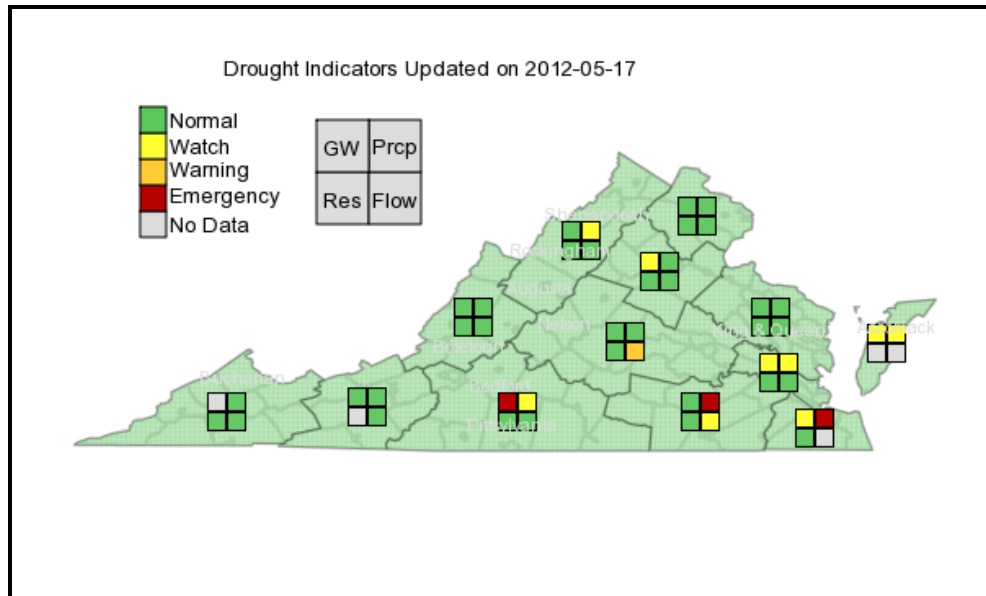
The Drought Monitor also gives *percentages* of the country, of regions, and of individual states classified in the drought categories. The following table shows how much of the country and of Virginia received different Drought Monitor ratings in recent months and one year ago.

Drought Monitor Report Date	Percentage of area rated “abnormally dry” (D0) or worse	Percentage of area rated “severe drought” (D2) or worse
5/15/12	US = 46%; VA = 54%	US = 15%; VA = 0%
4/17/12	US = 50%; VA = 62%	US = 16%; VA = 11%
3/13/12	US = 49%; VA = 19%	US = 18%; VA = 0%
2/14/12	US = 48%; VA = 26%	US = 15%; VA = 0%
5/17/11	US = 30%; VA = 35%	US = 17%; VA = 12%

From the Virginia Drought Monitoring Task Force

Another look at water conditions comes from the **Virginia Drought Monitoring Task Force**, which regularly produces a map rating groundwater levels, precipitation deficits, reservoir storage, and streamflow conditions across the Commonwealth. The May 17, 2012, map is shown below. In each area, a color code indicates “normal,” “watch,” “warning,” or “emergency conditions.” The current map and more information on the ratings are available online at

<http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/Drought.aspx>.



Other Useful Sources of Information Online

- Va. Dept. of Forestry map of local burning restrictions: <http://www.dof.virginia.gov/fire/burn-bans.htm>.
- Va. Dept. of Environmental Quality water-conservation information: <http://www.deq.virginia.gov/Programs/PollutionPrevention/VirginiaGreen/ResourcesLinks/Water.aspx>.

Don't Forget the Water Center's Other Water Status Services!

The Water Center's online “Water Status Information” area has links to current and historical information on drought, groundwater, precipitation, stream flow, and severe weather. Find it at www.vwrrc.vt.edu/water_status.html.

And the Virginia Water Central News Grouper, at <http://vawatercentralnewsgrouper.wordpress.com/>, posts a Virginia water-status update at the beginning of each month and a drought update each mid-month. Click the “Weather” category for past posts.

VIRGINIA GOVERNMENT WATER ISSUES OVERVIEW

For an online list of upcoming Virginia government meetings on water-related topics, updated weekly, visit the “Quick Guide to Virginia Water-related Events,” at <http://virginiawaterevents.wordpress.com/> and click on the “Government” category (right side of page).

This section lists water issues under consideration (study or regulation) between **January 18-May 31, 2012**, by state boards, commissions, or agencies in Virginia. This list *does not necessarily include all* meetings of significance to Virginia water resources, and *does not list regular meetings* of state boards or commissions. Information in this issue is based on public meetings listed on the **Virginia Regulatory Town Hall** Web site, at www.townhall.state.va.us/L/meetings.cfm. The Town Hall site posts agendas of upcoming meetings and minutes of past meetings; the site can be searched for “water” or other specific topics. Unless otherwise noted, all contact people listed in this section are Virginia state employees. **To find the e-mail address any state employee**, go online to <http://www.employeedirectory.virginia.gov/>. You can also request state employee phone numbers by calling (800) 422-2319. All Web sites listed in this section were functional as of 5/24/12.

Abbreviations: DCR = Dept. Conservation and Recreation; DEQ = Dept. Environmental Quality; DGIF = Dept. Game and Inland Fisheries; DMME = Dept. Mines, Minerals and Energy; DPOR = Department of Professional and Occupational Regulation; SWCB = State Water Control Board; VDH = Department of Health. “VAC” numbers indicate the *Virginia Administrative Code* section for a particular regulation; you can access and search the VAC at <http://leg1.state.va.us/cgi-bin/legp504.exe?000+men+SRR>. “NOIRA” stands for Notice of Intended Regulatory Action.

Total Maximum Daily Load (TMDL) Processes

Under the federal Clean Water, when a water body fails (with a certain frequency) to meet state water-quality standards, the water is to be designated as “impaired,” requiring development of a total maximum daily load (TMDL). A TMDL *study* identifies the pollutant source(s) causing the impairment and determines how much of the pollutant(s) the water can receive (the “load”) and still meet standards. A TMDL *implementation plan* (required by Virginia law) maps a process for reducing the pollutant load to the TMDL level. Many Virginia TMDLs are underway, each involving many public meetings. The table below lists those where public meetings were held during the period noted above. Information on the status of all TMDLs in Virginia is available online at <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL.aspx>.

Location	Water(s) & Impairment	Larger Watershed(s)	Most Recent Meeting Date	For More Information
Chesapeake Bay watershed	Nutrient- and sediment-caused impairments to dissolved oxygen, water clarity, and aquatic life in the Bay and its tributaries	Atlantic Ocean	3/15/12 (Phase II Watershed Implementation Plan (WIP) Stakeholder Advisory Group); May 9-31 (Seven public-comment meetings for Virginia’s Phase II WIP)	David Dowling, DCR
Accomack County	Gargathy Creek (aquatic life, bacteria, and dissolved oxygen), Finney Creek (bacteria), Northam Creek (dissolved oxygen), Folly Creek (aquatic life and dissolved oxygen), Ross	Atlantic Ocean	3/28/12	Jennifer Howell, DEQ

	Branch (aquatic life) and Wachapreague Channel (bacteria)			
Albemarle County and City of Charlottesville	Bacteria impairments in Schenks Branch, Meadow Creek, Lodge Creek, and Moores Creek watersheds	James River	3/15/12	Tara Sieber, DEQ
Charles City, Hanover, Henrico, and New Kent counties and City of Richmond	Bacteria impairments in the Chickahominy River and tributaries	James River	5/24/12	Margaret Smigo, DEQ
Clarke County	Bacteria and aquatic life (benthic) impairments in Spout Run and Page Brook	Shenandoah River/Potomac River	4/3/12	Nesha McRae, DCR
City of Falls Church	Aquatic life (benthic) impairments in Holmes Run and Tripps Run	Potomac River	5/24/12	Jennifer Carlson, DEQ
Gloucester, Mathews, and Middlesex counties	Bacteria impairments in the Upper Piankatank River and in nine tidal shellfish waters that flow into the Piankatank River and Milford Haven (Queens, Stutts, Morris, Billups, Edwards, Harper, Wilton, Healy and Cobbs)	Chesapeake Bay	5/23/12	May Sligh, DCR
Greensville, Southampton, and Sussex counties	Bacteria impairments in Darden Mill Run, Flat Swamp, Mill Swamp, Tarrara Creek, and Three Creek; and possible dissolved oxygen and pH impairments in Darden Mill Run, Flat Swamp, and Mill Swamp	Chowan River	2/15/12	Jennifer Howell, DEQ
Nelson County	Bacteria impairments in the North Fork Rockfish River, South Fork Rockfish River, Rockfish River and Taylor Creek; and aquatic-life impairments in Taylor Creek	James River	5/16/12	Tara Sieber, DEQ
Northampton County	Dissolved oxygen, pH, and bacteria impairments in Mill Creek	Atlantic Ocean	3/12/12	Jennifer Howell, DE.
Cities of Portsmouth and Suffolk	Bacteria impairments in Hoffer Creek	Hampton Roads/ Chesapeake Bay	5/14/12	Jennifer Howell, DEQ
Prince William and Stafford counties	Bacteria impairments in Powells Creek, Quantico Creek, South Fork Quantico Creek, North Branch Chopawamsic Creek, Austin Run, Accokeek Creek, Potomac Creek, Potomac Run, and an unnamed tributary	Potomac River	2/1/12	Katie Conaway, DEQ
Russell and Tazewell counties	Bacteria impairments in the Clinch River and tributaries (Maiden Spring Creek and	Upper Tennessee River/Ohio River	5/24/12	Martha Chapman, DEQ

	Little River in Tazewell County, and Indian Creek, Weaver Creek, Swords Creek, Lewis Creek, and Big Cedar Creek in Russell County)			
Wythe County	Bacteria impairments in South Fork Reed Creek, Mill Creek, Stony Fork, Tate Run, Reed Creek, Miller Creek, and Cove Creek	New River	4/19/12	Martha Chapman, DEQ

Other Topics

Items below are listed alphabetically by topic, followed by the agency or group coordinating state study or action and then a contact name. More information on the meetings listed is available at the Virginia Regulatory Town Hall Web site, www.townhall.state.va.us/L/meetings.cfm (organized by date, going back one year).

Above-ground Storage Tanks Regulation (9 VAC 25-91)

2/7/12, 3/12/12, and 4/16/12: meetings of the **regulatory advisory panel** assisting the DEQ and State Water Control Board in considering amendments to this regulation. More information: Melissa Porterfield, DEQ.

Biosolids Land-application Permit Requests

3/6/12, **Charles City County**: Public meeting on application by Nutri-Blend, Inc., to land-apply biosolids on approximately 9456 acres; more information: Mark Mongold, DEQ.

Drinking Water Infrastructure Construction Funding

2/8/12 through 2/16/12: Virginia Department of Health workshops on drinking water infrastructure-construction funding available through the **Drinking Water State Revolving Loan Fund Program** and the **Water Supply Assistance Grant Fund Program**. More information: J. Dale Kitchen, VDH.

Electricity Generation: Coal-fired to Biomass-fired Conversions

4/16/12: Three public hearings (in three locations) by the Air Pollution Control Board and Virginia DEQ on requests by VEPCO for permits to convert from coal to biomass as the fuel source at the **Hopewell, Altavista, and Southampton power stations**. Each permit covers the expected emissions of particulate matter (various sizes), sulfur dioxide, volatile organic compounds, nitrogen oxides; and carbon monoxide. More information: Tom Berkeley, Kelly Giles, or Richard Stone (all DEQ).

Exceptional Waters Designations

3/7/12: Regulatory advisory panel assisting with the proposed Exceptional State Waters designation of a **portion of Bull Run** (on the border between Prince William County and Fairfax counties, from the northern limit of Manassas Battlefield Park to Interstate 66). More information: David Whitehurst, DEQ.

Mined Lands Reclamation

2/17/12: Public-comment meeting on DMME's Fiscal Year 2012 **Abandoned Mine Land Grant Application**. Each year, DMME applies to the federal Office of Surface Mining for grants to reclaim high-priority abandoned mine lands. Information about Virginia's program is available online at <http://www.dmme.virginia.gov/DMLR/docs/aml.shtml>. More information: Roger Williams, DMME.

4/18/12: **Abandoned Mine Land Advisory Committee** meeting. More information: Roger Williams, DMME.

5/30/12: **Orphaned Land Advisory Committee** meeting. This committee assists the DMME in prioritizing sites to be reclaimed via funding from the Orphaned Land Fund. In 1978, Virginia passed legislation establishing a *non-coal* orphaned land reclamation program intended to reclaim lands affected by mining for some 50 metals and other minerals during Virginia's history. Funds for the program come from interest on money in a state-managed, industry self-bonding program. Information on the Orphaned Land

Program is available online at <http://www.dmme.virginia.gov/dmm/orphaned%20land.shtml>. More information: Allen Bishop, DMME.

Nuclear Power

1/18/12: Public hearing on a proposed Virginia Water Protection Permit for a subsidiary of Dominion Virginia Power to withdraw water from Lake Anna to support operation of a possible third unit at the **North Anna Power Station in Louisa County**. More information: Sarah Marsala, DEQ. *[Please see also the news item on this topic, on p.10 of this newsletter.]*

Resource Management Plan Regulations

2/4/12: Meeting of **regulatory advisory panel** assisting the DCR in developing resource management plan regulations. More information: David Dowling, DCR.

Scenic Rivers

1/18/12 and 5/16/12: Meetings of the **Goose Creek Scenic River** Advisory Committee. More information: David Dowling, DCR.

Solid Waste Management

4/18/12: Meeting of the **Discussion Group Regarding Solid Waste Permitting Program**. This stakeholder group is examining the efficiency and effectiveness of Virginia's solid waste permitting program. More information: Justin Williams, DEQ.

5/31/12: DEQ public meeting on a proposed **statewide variance for beneficial use** of lightly contaminated soil, debris, and sediment. More information: Justin Williams, DEQ.

State Water Supply Plan

2/29/12 and 5/3/12: Meetings of the **State Water Supply Plan Advisory Committee**. The Committee was established by the 2010 Virginia General Assembly (SB 569; information about that bill is available at <http://leg1.state.va.us/cgi-bin/legp504.exe?101+sum+SB569>) to assist the DEQ in developing, revising, and implementing a state water resources plan. More information: Tammy Stephenson, DEQ.

Stormwater

1/23/12 and 4/23/12: meetings of the **Virginia Stormwater Best Management Practices (BMPs) Clearinghouse Committee**. The Stormwater BMPs Clearinghouse is a Web site on design standards and specifications of stormwater BMPs approved for use in Virginia to control the quality and/or quantity of stormwater runoff. The Clearinghouse Web site is <http://www.vwrrc.vt.edu/swc/>. More information: David Dowling, DCR.

3/29/12 and 5/17/12: meetings of the Virginia DCR's **Local Government Advisory Committee** on how to help advise the DCR in developing local stormwater programs statewide under **new stormwater regulations** by the July 1, 2014, implementation date. More information: David Dowling, DCR.

Uranium Mining

3/7/12: meeting of the **Virginia Coal and Energy Commission's Uranium Mining Subcommittee**. More information: Martin Farber, Division of Legislative Services.

Virginia Outdoors Plan

1/19/12 through 3/29/12: Several dozen public meetings (held in about 20 locations statewide) by the Virginia DCR on the **Virginia Outdoors Plan**. The DCR is developing the 2013 update to the Virginia Outdoors Plan (the 10th update since the first plan was developed in 1966), which is a comprehensive plan for acquisition, development, and management of outdoor recreation and open space resources. For details, see http://www.dcr.virginia.gov/recreational_planning/vop.shtml. More information: Janit Llewellyn Allen, DCR.

Wastewater Permits

2/16/12: meeting of the technical advisory committee on the **general permit for wastewater discharges containing petroleum**. The committee is assisting the DEQ in developing possible amendments to the general permit covering point-source discharges of wastewater from sites contaminated by petroleum products and chlorinated hydrocarbon solvents, and point-source discharges of hydrostatic test wastewaters resulting from testing of petroleum and natural gas storage tanks and pipelines. The relevant section in the *Virginia Administrative Code* is 9 VAC 25-120. More information: Burt Tuxford, DEQ.

5/1/12 and 5/24/12: meetings of the advisory committee on the **general permit for discharges from concrete products facilities**. The committee is assisting in considering possible amendments to this regulation. The relevant section in the *Virginia Administrative Code* is 9 VAC 25-193. More information: Elleanore Daub, DEQ.

Water Quality Standards

5/3/12: meeting of the **Scientific Advisory Group on the James River Chlorophyll Study**. The advisory group is assisting the DEQ on the approach, scope, and design of a study to reexamine the current chlorophyll-a criteria for the tidal James River. The relevant section in the *Virginia Administrative Code* is VAC 25-260-310 bb. More information: Arthur Butt, DEQ.

Water Reclamation and Reuse Regulation

1/24/12 and 3/27/12: meetings of the **Stakeholder Advisory Group for Groundwater Recharge with Reclaimed Water**. The DEQ formed this advisory group to assist with possible groundwater-recharge-related changes to Virginia's Water Reclamation and Reuse Regulation. The relevant section in the *Virginia Administrative Code* is 9 VAC 25-740. More information: William Norris, DEQ.

Wind Energy

2/15/12 and 4/19/12: meetings of the **Virginia Offshore Wind Development Authority**. More information: Evie Christopher, DMME.

3/29/12: meeting of the **Local Government Stakeholder Group on a model wind-energy ordinance**. More information: Carol Wampler, DEQ.

General Information for Key Water-related Statewide Boards and Commissions (as of 5/24/12)

Marine Resources Commission—Meets monthly. Phone (757) 247-2200, TDD (757) 247-2292. Web site: <http://www.mrc.virginia.gov/index.shtm>.

State Water Control Board—Meets quarterly. Phone (800) 592-5482 (main number for DEQ; toll-free in Virginia). Web site: <http://www.deq.state.va.us/LawsRegulations/CitizenBoards.aspx>.

Cave Board—Meet three times per year. Phone (804) 786-7951 (DCR's Natural Heritage Program); Web site: www.dcr.virginia.gov/natural_heritage/cavehome.shtml.

Conservation and Recreation Board—Meets at least three times/year, upon call of chair. Phone: (804) 786-1712 (main number for DCR); Web site: www.dcr.virginia.gov/bcr.shtml.

Game and Inland Fisheries Board—Full board meets bimonthly; committee meetings at other times. Phone: (804) 367-1000 (main number for DGIF); Web site: www.dgif.virginia.gov/about/board/.

Gas and Oil Board—Meets monthly, usually in southwestern Virginia. Phone: (276) 415-9700 (DMME's Division of Gas and Oil); Web site: www.dmme.virginia.gov/divisiongasoil.shtml.

Groundwater Protection Steering Committee—Meets third Tuesday of odd-numbered months. Phone: Mary Ann Massie, (804) 698-4042; Web site: <http://www.deq.state.va.us/Programs/Water/WaterSupplyWaterQuantity/GroundwaterProtectionSteeringCommittee.aspx>.

Land Conservation Foundation—Meets about three times per year. Phone (804) 225-2048; Web site: www.dcr.virginia.gov/virginia_land_conservation_foundation/index.shtml.

Licensing and Regulation Boards—Licensing boards for engineers, geologists, onsite sewage system professionals, soil scientists, waste-management facility operators, waterworks and wastewater works operators, and wetland delineators are under the Dept. of Professional and Occupational Regulation. Phone (804) 367-8500, TDD (804) 367-9753; Web site: www.dpor.virginia.gov/dporweb/boards.cfm.

Outdoors Foundation—Meets at least quarterly. Phone: (540) 327-7727; Web site: www.virginiaoutdoorsfoundation.org.

Scenic River Advisory Board—Meets at least two times a year. Phone: Lynn Crump, (804) 786-5054; Web site: www.dcr.virginia.gov/recreational_planning/srmain.shtml.

Soil and Water Conservation Board—Meets bimonthly. Phone: (804) 786-2064 (DCR's Stormwater Management Division); Web site: http://www.dcr.virginia.gov/stormwater_management/vs_and_wcb.shtml.

Waste Management Board—Meets about three times per year. Phone: (800) 592-5482 (main number for DEQ); Web site: <http://www.deq.state.va.us/LawsRegulations/CitizenBoards.aspx>.

N O T I C E S

*If you would like to receive **regular e-mail notifications** about meetings, reports, and other items related to water quality and water monitoring, you may do so by joining the **Virginia Water Monitoring Council**; contact Jane Walker at (540) 231-4159 or janewalk@vt.edu.*

For a regularly updated, online list of Virginia water-related events, please see the Water Center's "Quick Guide to Virginia Water Conferences, Meetings, and Other Events," at <http://virginiawaterevents.wordpress.com/>. All Web sites listed in this section were functional as of 5/24/12.

Stewardship Virginia Runs April 1-May 31 and Again September 1-October 31

Stewardship Virginia is a statewide initiative held twice annually to help citizens with projects that enhance and conserve Virginia's natural and cultural resources. According to a March 22, 2012, news release from the governor's office, "Stewardship Virginia promotes waterway adoption, trail improvement, the planting of riparian buffers, invasive species control, habitat improvement and landscaping for conservation." 2012 is the tenth year for the campaign, and April 1-May 31 and September 1-October 31 are the two time periods again this year. To learn how you can get involved—including getting a certificate from the governor!—visit the Virginia Department of Conservation and Recreation's Web site at www.dcr.virginia.gov/stewardship/. More information is also available by phoning (877) 42-WATER (877-429-2837; in Richmond, 786-5056).

Virginia Citizen Monitoring Grants for 2013 – Proposals Due July 2, 2012

The Virginia Department of Environmental Quality (DEQ) is accepting applications for Citizen Monitoring Grants for 2013. **Applications are due by July 2, 2012.** Information on citizen monitoring grants is available online at <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityMonitoring/CitizenMonitoring.aspx>. For more information, contact Stuart Torbeck at charles.torbeck@deq.virginia.gov or (804) 698-4461.

You Don't Have to Be a Marine to Attend "Wetland Boot Camp" – Register by July 23

The wetlands-focused non-profit organization Environment Concern, located in St. Michaels, Maryland, is offering "Wetland Boot Camp," a summer institute in Virginia for K-12 teachers and environmental educators. Four day-long and one half-day workshops on wetlands will be held August 6-10 in Gainesville (Prince William County). Each workshop has a fee between \$30 and \$50, but the **series will be offered for free to the first four registering teachers** from each of the Virginia counties of Fairfax, Fauquier, Loudoun, Prince William, and Stafford (courtesy of Wetlands Studies and Solutions in Gainesville, where the workshops will be held). Registration is due by July 23, 2012. The same workshops are held in other locations in the region; for the full schedule, and for more information, contact Environment Concern at (410) 745-9620 or visit <http://www.wetland.org>.

18th Annual Virginia Waterways Cleanups - September 1—October 31, 2012

Clean Virginia Waterway's annual Waterways Cleanup Day is a series of local beach, bay, river, stream, lake, and pond cleanups across the state in September and October. 2012 is the 18th year that the organization has coordinated the Virginia cleanup as part of the International Coastal Cleanup, organized by the Ocean Conservancy (<http://www.oceanconservancy.org/>). For more information about joining or sponsoring a Virginia event: (434) 395-2602 or cleanva@longwood.edu; Web site: www.longwood.edu/cleanva/iccva.htm.

World Water Monitoring Day is Longer than 24 Hours

The World Water Monitoring Challenge is an international program to raise awareness of water issues and increase public participation in water resources protection. Organized by the Water Environment Federation and the International Water Association, the challenge is a revision of the previous World Water Monitoring Day. The groups officially recognize September 18 as world monitoring day, but monitoring groups may participate by submitting data anytime between March 22 (World Water Day—see

<http://www.worldwaterday.org/>) and December 31. For more information about World Water Monitoring Day, see www.worldwatermonitoringday.org. Monitoring groups may register at this site.

Virginia DEQ Information on “Microconstituents”

“Emerging contaminants” is a widely used (although not completely accurate) term for a range of chemicals that are not routinely monitored or regulated but that can affect aquatic life and potentially human health. This broad group of chemicals includes pharmaceuticals, personal care products, agricultural chemicals, and others. In addition, the term “endocrine disruptors” is often applied to chemicals (from various sources) that can affect hormonal systems in aquatic organisms. Because the groups of chemicals typically are found in very small levels, “microconstituents” is another term used. The Virginia Department of Environmental Quality (DEQ) has compiled information about such substances on its “Microconstituents in the Environment” Web page, online at <http://www.deq.state.va.us/Programs/Water/PermittingCompliance/PollutionDischargeElimination/Microconstituents/MicroconstituentsintheEnvironmentLinks.aspx>. Be sure to note the **link to collection events** for expired and unused household pharmaceuticals.

Speaking of Very Small Quantities: Nanomaterials Report Released in January 2012 from National Research Council

A Research Strategy for Environmental, Health, and Safety Aspects of Engineered Nanomaterials (January 2012, 212 pages) “presents a strategic approach for developing research and a scientific infrastructure needed to address potential health and environmental risks of nanomaterials,” according to the National Academies’ January 25, 2012, news release on the report. The news release and access to the report are available at <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13347>.

Giving Gifts of Trees in Fairfax County

Reforest Fairfax offers the opportunity to give the gift of five native trees planted in Fairfax County. The program is coordinated by the Fairfax County Restoration Project (<http://www.fcrpp3.org/>) and the trees are planted by the Fairfax ReLeaf program (<http://www.fairfaxreleaf.org/FFR/Index.html>). Information is available online at <http://www.fcrpp3.org/reforestfairfax/>, or contact the program at fcrpp3@gmail.com.

Funding Sources for Chesapeake Bay TMDL Projects

The Virginia Department of Conservation and Recreation (DCR) has set up a Web page listing potential sources of funding for projects that reduce nutrient or sediment inputs to the Chesapeake Bay and help Virginia meet its goals under the Commonwealth’s Phase II Watershed Implementation Plan of the Chesapeake Bay Total Maximum Daily Load (TMDL). Links to these funding sources are available at <http://www.dcr.virginia.gov/vabaytmdl/baytmdlgrantfunding.shtml>.

James River Hero Home Program

On March 1, 2012, the James River Association (JRA) began its “James River Hero Home,” program, which certifies residences that take six steps to reduce runoff of stormwater, lawn fertilizers, and pet waste. For more information, visit <http://www.jamesriverassociation.blogspot.com/2012/02/help-protect-james-by-becoming-river.html>, or contact the JRA at (804) 788-8811 or info@jamesriverassociation.org.

25 Years of Coastal Zone Management in Virginia

2011 was the 25th year of work by Virginia’s Coastal Zone Management Program, which is now operated out of the Virginia Department of Environmental Quality. The Fall 2011 Anniversary Edition of *Virginia Coastal Zone Management*, the program’s semi-annual magazine, tells the story of the program’s work to maintain water quality, protect and restore coastal habitats, provide coastal mapping services, promote informed decision-making, increase public access, sustain fisheries, and meet other planning and management goals. The magazine is online at <http://www.deq.state.va.us/Programs/CoastalZoneManagement.aspx>, or contact the editor at (804) 698-4320 or virginia.witmer@deq.virginia.gov.

Sea-Level Rise in Hampton Roads

“Sea Level Along Chesapeake Rising Faster than Efforts to Mitigate It,” by Rona Kobell in the January-February 2012 issue of *Bay Journal*, describes current and predicted impacts of rising sea levels in the

Hampton Roads area of Virginia. Resulting from warmer global temperatures and subsiding land in the region, Hampton Roads' rising levels are the largest along the Atlantic Coast, prompting local governments, businesses, and citizens to consider various actions to respond to a threat of increased urban flooding. The article describes the Hampton Roads situation, puts it in the larger Chesapeake Bay region context, and lists several sources for more information. The article is available online at

<http://www.bayjournal.com/article.cfm?article=4270>, or contact *Bay Journal* at (717) 428-2819.

Shenandoah Valley Wastewater Challenges

“Improvements in Shenandoah from Plant Upgrades Come at Great Cost,” by Rona Kobell in the April 2012 issue of *Bay Journal*, examines the issues and challenges faced by three Shenandoah Valley, Va., localities: Broadway (Rockingham County), Woodstock (Shenandoah County), and Berryville (Clarke County) as Chesapeake Bay watershed localities have been required to improve the nutrient-removal capabilities of their wastewater-treatment plans. Interviews with local elected officials and treatment plant operators address issues of costs, state regulatory actions, impacts on rates, impacts in elections, impacts on water quality, and the connection between nutrient requirements and population growth in driving treatment-plant upgrades. *Bay Journal's* issues archive is available online at <http://www.bayjournal.com/backissues/>, or contact *Bay Journal* at (717) 428-2819 or bayjournal@earthlink.net.

Virginia Native Plant Finder

The Virginia Department of Conservation and Recreation (DCR) has developed an online search tool for the information in its “Native Plants for Conservation, Restoration, and Landscaping” brochures. By submitting a common or scientific name, the user accesses information on whether the plant is a Virginia native or not, along with the region(s) where the plant is found, its habitat preferences, and its value for wildlife, horticulture, etc. A link to the online native plant finder is available at http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml, where you can also access PDF files of the brochures, which are organized by Virginia's regions and habitats. For more information, contact Rene Hypes, Va. DCR/Division of Natural Heritage, 217 Governor St., Richmond, VA 23219; e-mail: rene.hypes@dcr.virginia.gov.

Water and Other Natural Resources on the Air

Virginia Water Radio, online at <http://www.virginiawaterradio.org>, is the Virginia Water Center's weekly broadcast/podcast about water in Virginia. Here are **some other audio options** for learning about water and other natural resources.

Water Spots—one-minute public service announcements; from the City of Grand Rapids, Michigan. Online at <http://cfpub.epa.gov/npstbx/relatedpopup.cfm?RelatedMaterialID=53>.

On Delmarva—one-hour feature stories, not only about water, but with lots of water stories; on Delmarva Public Radio. Online at <http://www.ondelmarva.org/>.

Playa Country Radio—weekly program about conservation of wildlife habitat in the western Great Plains; produced by the Playa Lakes Joint Venture and carried on High Plains Public Radio. Online at <http://www.pljv.org/news/playa-country>.

Earth Gauge Radio—30-second segments with tips and facts on conservation, wildlife, etc.; produced by the National Environmental Education Foundation. Online at <http://www.earthgauge.net/radio>.

Montana Forestry Minute—one-minute spots five days a week by Peter Kolb, an extension forestry specialist at Montana State University. Broadcast on KGVO in Missoula and KLYQ in Hamilton. Online at <http://kgvo1290.com/montana-forestry-minute>.

If you know of other radio shows about water, Virginia Water Radio would like to know about them. Please contact Alan Raflo at araflo@vt.edu or (540) 231-5463.

National Wetlands Report for 2004—2009

Status and Trends of Wetlands in the Conterminous United States—2004-2009 was published in October 2011 by the U.S. Fish and Wildlife Service. The 112-page report, submitted to Congress by the U.S. Department of the Interior, documents the extent and habitat type of wetlands as determined by examination of remotely sensed imagery for 5,042 randomly selected sample plots, in combination with field verification. According to the Interior Department's October 6, 2011, news release on the report, during the period covered the United States experienced a “net wetland loss...estimated to be 62,300 acres..., bringing

the nation's total wetlands acreage to just over 110 million acres in the continental United States, excluding Alaska and Hawaii." The report found that the rate of gain in wetlands acres increased by 17 percent compared to the previous reporting period of 1998 to 2004, but the rate of loss increased by 140 percent. Forest wetlands, particularly, experienced acreage losses. This report, previous reports going back to the 1950s, and various regional reports are online at <http://www.fws.gov/wetlands/Status-And-Trends-2009/index.html>.

Gulf Coast Restoration Strategy

In December 2011, the Gulf Coast Ecosystem Restoration Task Force released *Gulf of Mexico Regional Ecosystem Restoration Strategy*, a 128-page document describing recommended actions to restore wetlands and other habitats, reduce excessive nutrients and other pollutants, and enhance the quality of life of Gulf Coast communities. (In Virginia, the New, Big Sandy, and Clinch/Powell/Holston river basins in the southwestern part of the state are all part of the Gulf of Mexico watershed.) The Task Force, established by an October 2010 Executive Order from President Obama after the Deepwater Horizon oil spill, included representatives from the five Gulf Coast states and 11 federal agencies. According to the Task Force's Web site, the strategy is the "first restoration blueprint ever developed for the Gulf with the full involvement of all of the essential parties throughout the region, including the states, tribes, federal agencies, local governments and thousands of involved citizens and organizations." The strategy and other Task Force documents are available online at <http://www.epa.gov/gcertf/>. For more information, contact Alisha Johnson with the U.S. EPA at johnson.alisha@epa.gov or 202-564-4373; or Jody Fagan with the U.S. Department of Agriculture's Gulf of Mexico Initiative at (202) 720-3210.

Examining the Historic Drought in Texas

•In "Coping with Climate Change: 2 Texas Towns Struggle for Water," a 10-minute segment aired on March 22, 2012, PBS' Newshour examined the current drought in Texas, its connection to warmer-than-normal temperatures, and its impact on municipal water supplies. The segment is online at http://www.pbs.org/newshour/bb/climate-change/jan-june12/texaswater_03-22.html.

•"Texas Drought: Now and Then" is the theme of the Fall 2011 issue of *tx H₂O*, the newsletter of the Texas Water Resources Institute. Articles examine the effects of the current (as of April 2012) multi-year drought, the 1950s "drought of record" in the Lone Star State, the interactions of energy and water, drought detection, water re-use, and Texas' current five-year water plan. Across the bottom of these articles is a timeline of Texas water events (including droughts) from 1800 to the present. The newsletter is available online at <http://twri.tamu.edu/txh2o>, or contact the Texas Water Center at (979) 845-1851 or twri@tamu.edu.

USDA Report on Nitrogen Use in Agriculture

In September 2011, the U.S. Department of Agriculture's (USDA) Economic Research Service published *Nitrogen in Agricultural Systems: Implications for Conservation Policy* (Report No. ERR-127; 89 pages). According to the USDA's online summary, the report "explores the use of nitrogen in U.S. agriculture and assesses changes in nutrient management by farmers that may improve nitrogen use efficiency." The report found that "about two-thirds of U.S. cropland is not meeting three criteria for good nitrogen management related to the rate, timing, and method of application." The report also explores different policy approaches that might "induce farmers to improve their nitrogen management and reduce nitrogen losses to the environment." Access to the report is available at <http://www.ers.usda.gov/Publications/ERR127/>.

Triennial World Water Forum Held in March 2012 in France

The 6th World Water Forum was held March 12-17, 2012, in Marseille, France. Since 1997, the event has been held once every three years to "[mobilize] creativity, innovation, competence and know-how in favour of water," according to the Forum's Web site. The 2012 forum attracted participants from 173 countries and 3500 non-governmental organizations. Information about the 2012 World Water Forum is available online at <http://www.worldwaterforum6.org/en/>. One special session in this year's forum was on "Water in the American West." An article on this forum is available in the April 30, 2012, issue of *Montana Water News*, from the Montana Water Center, online at <http://water.montana.edu/mwnewsletter/>, or contact the Montana center at (406) 994-6690 or water@montana.edu.

Energy and Climate Notices

•In January 2012, the U.S. Government Accountability Office (GAO) released *Information on the Quantity, Quality, and Management of Water Produced during Oil and Gas Production* (GAO-12-156, Jan. 9, 2012, 56 pages). The report examines the production of an estimated 56 million barrels per day of “produced water” from onshore oil and gas production activities, and its disposal primarily (over 90 percent) through underground injection. According to the GAO’s “Highlights” of the report, the study was designed to determine “(1) what is known about the volume and quality of produced water from oil and gas production; (2) what practices are generally used to manage and treat produced water, and what factors are considered in the selection of each; (3) how produced water management is regulated at the federal level and in selected states; and (4) what federal research and development efforts have been undertaken during the last 10 years related to produced water.” The report is available online at <http://www.gao.gov/products/GAO-12-156>; or contact Anu Mittal or Frank Rusco at (202) 512-3841 or mittala@gao.gov or ruscof@gao.gov.

•The Georgetown University Law Center in Washington D.C., operates the **Georgetown Climate Center**, which seeks to “advance effective climate, energy, and transportation policies in the United States—policies that reduce greenhouse gas emissions and help communities adapt to climate change,” according to the Center’s Web site. The Web site includes an “**Adaptation Clearinghouse**” that provides access to information resources on adapting to climate change. The Clearinghouse is available at <http://www.georgetownclimate.org/adaptation/clearinghouse>.

Upcoming Conferences, Workshops, and Other Events

Events In Virginia

•Continuing June through August 14, various locations: **Virginia Forest Landowner Education Spring and Summer Events**. More information: Jen Gagnon, phone (540) 231-6391, e-mail: jgagnon@vt.edu; <http://cnre.vt.edu/forestupdate/pages/calendar.html>.

-Jun. 2, Blue Ridge Community College, Weyers Cave: **Backyard Woods Workshop**.

-Jun. 16, Randolph Farm, Petersburg: **Forestry 101 Short Course**.

-Aug. 14 and 21, Stonewall Jackson Hotel & Conference Center, Staunton: **Family Forestland Short Course: Focusing on Land Transfer to Generation “NEXT”**.

•Continuing June-August, two events/locations: **Virginia Herpetological Society annual surveys**. More information: <http://www.virginiaherpetologicalsociety.com/2012-events/2012-vhs-events/index.htm>.

-Jun. 23-24: **Annual “HerpBlitz”** at the Mattaponi Wildlife Management Area along the Mattaponi River in Caroline County.

-Aug. 18: **Caledon Natural Area State Park Survey** along the Potomac River in King George County.



Lizard's-tail (*Saururus cernuus*) in Caledon State Park, June 30, 2009.

Virginia Events, cont.

- Jun. 2, at various locations in the Chesapeake Bay watershed: **23rd Annual Clean the Bay Day**. Organized by the Chesapeake Bay Foundation. Registration and more information: <http://www.cbf.org/clean>, phone (800) SAVEBAY (800-728-3229); e-mail: ctbd@cbf.org.
- Jun. 2: **20th Annual Potomac River Swim for the Environment**. Swimmers will dive into the Potomac at Hull Neck in Northumberland County, Virginia, and swim 7.5 miles to Point Lookout State Park in Maryland. More information: <http://www.potomacriver-swim.com>; phone (202) 387-2361; e-mail: cherylw@crosslink.net,;
- Jun. 12-14, Hilton Garden Inn, Suffolk: **Ecology and Management of Atlantic White Cedar Symposium**. Organized by North Carolina State University and hosted by Great Dismal Swamp National Wildlife Refuge. More information: <http://www.ncsu-feop.org/AWC/index.html>; phone (919) 515-9563 or (919) 515-3184; e-mail: forestry_outreach@ncsu.edu.
- Jul. 21-23, Virginia Beach: **57th South Atlantic Well Drillers Jubilee**. More information: <http://www.jubileewatershow.com>; phone (540) 754-3329; e-mail: info@jubileewatershow.com.
- Aug. 24-26, Hotel Roanoke and Conference Center: **Ninth International Conference on Recirculating Aquaculture**. More information: <http://www.recircaqua.com/icra.html>; phone (540) 553-1455; e-mail: aquaconf@gmail.com.
- Sep. 1-Oct. 31, statewide: **Waterways Cleanup Days**, organized by Clean Virginia Waterways. This is a series of local beach, bay, river, stream, lake, and pond cleanups across the state. Part of the International Coastal Cleanup, organized by the Ocean Conservancy. More information: www.longwood.edu/cleanva/iccva.htm; phone (434) 395-2602; e-mail: cleanva@longwood.edu.
- Sep. 14-16, Wyndham Virginia Crossings Conference Center, Glen Allen: **“Then and Now Along the James: Changing Landscapes, Changing Plants.”** Annual meeting of the Virginia Native Plant Society. More information: <http://vnps.org/wp/vnps-2012-annual-meeting-september-14-16/>; phone (540) 837-1600; e-mail: vnpsofc@shentel.net.

Events Elsewhere

- May 30-June 1, 2012, Lincoln, Neb.: **Blue Water, Green Water and the Future of Agriculture—2012 Water for Food Conference**. Organized by the University of Nebraska’s Water for Food Institute. More information: <http://waterforfood.nebraska.edu/wff2012>; phone (402) 472-7003; e-mail: ebanset1@unl.edu.
- Jun. 25-29, 2012, Denver, Colo.: American Water Resources Association Summer Specialty Program—**Contaminants of Emerging Concern II: Research, Engineering, and Community Action** on Jun. 25-27, and **Riparian Ecosystems IV: Advancing Science, Economics, and Policy** on Jun. 27-29. More information: <http://www.awra.org/meetings/Summer2012/index.html>; phone (540) 687-8390; e-mail: info@awra.org.
- Jul. 17-19, 2012, Santa Fe, N.M.: **“Managing Water, Energy, and Food in an Uncertain World.”** Annual conference of the Universities Council on Water Resources (UCOWR) and the National Institutes for Water Resources (NIWR). More information: ucowr@siu.edu; <http://www.ucowr.org>; phone (618) 536-7571.
- Jul. 22-25, 2012, Fort Worth, Tex.: **“Choosing Conservation—Considering Ecology, Economics, and Ethics.”** Annual conference of the Soil and Water Conservation Society. More information: <http://www.swcs.org/index.cfm?nodeID=34487&audienceID=1>; phone (515) 289-2331; e-mail: swcs@swcs.org.
- Aug. 28-30, 2012, Austin, Tex.: **Texas Groundwater Summit**. Organized by the Texas Alliance of Groundwater Districts. More information: <http://www.texasgroundwatersummit.com>; phone Angie Rhem at (800) 775-2774, ext. 211; e-mail: angie.rhem@iemshows.com.
- Sep. 28-30, National Conservation Training Center, Shepherdstown, W. Va.: **Chesapeake Watershed Forum**. Organized by the Alliance for the Chesapeake Bay. More information: <https://allianceforthebay.org/initiatives/connecting-people/chesapeake-watershed-forum/>; phone Lou Etgen at (443) 949-0575; e-mail: letgen@allianceforthebay.org.
- Oct. 11-12, 2012, Anaconda, Mont.: **Montana Water Conference**. Organized by the Montana Section of the American Water Resources Association and by the Montana Water Center. More information: <http://state.awra.org/montana/>; phone (406) 994-1772; e-mail: water@montana.edu.
- Oct. 16-17, 2012, St. Paul, Minn.: **Minnesota Water Resources Conference**. Organized by the University of Minnesota Water Resources Center. More information: <http://www.wrc.umn.edu/waterconf/>; (612) 624-9282; or umwrc@umn.edu.

AT THE WATER CENTER

To reach the Virginia Water Resources Research Center: phone (540) 231-5624; FAX (540) 231-6673; e-mail water@vt.edu; Web site www.vwrrc.vt.edu.

U.S. Army Corps of Engineers and National Institutes for Water Resources Request for Proposals for FY 2012—Due August 15, 2012

The U.S. Army Corps of Engineers' Institute for Water Resources (IWR), in cooperation with the National Institutes for Water Resources (NIWR), is requesting proposals for grants to support applied investigations in selected water-resources topic areas (see priorities listed below).

Awards will be made only to the Water Resources Research Institutes authorized by the Water Resources Research Act of 1984 and listed at <http://water.usgs.gov/wrri/institutes.html>. The institute in Virginia is the Virginia Water Resources Research Center. Individuals located at accredited colleges or universities other than those at which these institutes are located may submit an application through those institutes if the institute agrees to become the official applicant and does not charge an administrative fee and does not apply its institution's indirect cost rate to the award.

Funded projects must conclude by August 1, 2014. Grant proposals may request up to \$200,000 in federal funds. The government's obligation under this program is contingent upon the availability of funds.

Proposals must be submitted by 4:00 PM, Eastern Time, Monday, August 15, 2012.

The following priorities have been designated for this funding.

- Develop alternatives for the future role of the federal government pertaining to the nation's water resources as a result of the changing roles and capabilities of federal, state, and local water resources agencies; and evolving challenges such as demographic shifts, climate variation, economic changes, and similar influencers.
- Identify criteria, recommend roles for various levels of government, and develop procedural alternatives to describe tolerable and acceptable risk for critical infrastructure that could be applicable across a variety of infrastructures associated with water resources.
- Compare methodologies and approaches for harmonizing collaborative decision-making processes that recognize local and regional values with the need to achieve national level consistency with federal interests.
- Evaluate and assess the federal interest in coastal storm damages associated with storm surge, shoreline loss, navigation, terrestrial and wetland ecosystems, and similar impacted areas; and provide rationale for how, based on federal interest, the federal government should be involved with various structural and non-structural risk-reduction activities.
- Evaluate alternative methodologies for selecting and evaluating criteria for use in assessing water resources infrastructure (assets). The criteria should be suitable for use in multi-criteria decision analyses and should include all relevant areas of comparison, e.g., performance, cost, environmental suitability, etc.
- Identify and describe how select Corps of Engineers and non-government partnerships could initiate or more effectively yield self-sustaining water resources improvements, developments, and management that directly or indirectly benefit economically depressed and/or disadvantaged communities.
- Evaluate and provide recommendations concerning methodologies for comparing benefits and costs, within the context of the proposed Principles and Standards, for public safety issues to include use of evacuation plans, warning systems, land-use zoning, and similar activities in conjunction with traditional structural and nonstructural flood-protection methods.

A link to the Request for Proposals (in PDF format) is available online at the Water Center's Web site, www.vwrrc.vt.edu. For more information, contact Dr. Joe Manous, Institute for Water Resources/U.S. Army Corps of Engineers, 7701 Telegraph Road, Alexandria, VA 22315; joe.manous@usace.army.mil; (703) 428-7074.

Guide to *Water Central* Article Topics, June 1998–April 2012

Listed below are topics covered in longer *Water Central* items in issues from June 1998 (issue #1) through April 2012 (issue #58). Page numbers below refer to the *two*-column versions of each issue through December 2008 (since then, only a one-column version is available).

Feature Articles

- Chesapeake Bay Blue Crabs—Jun. 2008, p.18.
 Chesapeake Bay Policy Developments—Aug. 2009, p.3; Nov. 2009, p.17.
 Clean Water Act Jurisdiction—Jan. 2007, p.1; Dec. 2008, p. 7.
 Coastal Conditions—Aug. 2004, p.8.
 Desalination—Jan. 2005, p.1.
 Disaster Preparedness and Response ⁵—Aug.-Sep.2001, p.2; Jun. 2008, p.2; May 2010, p.22.
 Drinking Water—Dec. 1998, p.1; Feb. 1999, p.1; Jan. 2001, p.1; Jun. 2008, p.15 (Virginia Household Water Quality Program).
 Drought in 2007—Dec. 2007, p.1.
 Energy-Water Connections—Dec. 2008, p.4.
 Environmental Laboratory Certification Program—Aug. 2005, p.1.
 Federal Farm Bill—Jun. 2008, p.17.
 Flood Hazard Mitigation in Grundy, Va.—June 2006, p.1.
 Groundwater—Oct. 2002, p.1.
 Infrastructure (water and wastewater; needs, costs, etc.): Feb. 2010, p.3 (Amer. Society of Civil Engineers report).
 Invasive Plant Removal in Fairfax—Apr. 2009, p.25.
 James River Sojourn, Sep.2007, p.1.
 Marine Fisheries—Nov. 2003, p.2.
 Market-based Water Quality Management—Aug. 2003, p.2.
 Natural Gas in Southwestern Virginia—Dec. 2008, p.6.
 Non-tidal Wetlands—Nov. 2000, p.1.
 Nutrients—Jun. 2003, p.2; Jan. 2004, p.7.
 Oceans—Aug. 2004, p.1 (report of Oceans Commission).
 Off-shore Gas and Oil Exploration Reports—Feb. 2006, p.14; Sep.2006, p.1.
 Rappahannock River Water Resources Planning—Feb. 2002, p.1.
 Regional Water Authority (Roanoke area)—Aug. 2005, p.7.
 Shenandoah River Fish Kills—Jun. 2008, p.11.
 Stormwater—Feb. 2000, p.1 (urban stormwater); Aug. 2009, p.7 (Virginia regulation proposals); Aug. 2010, p.6 (student intern introductory article).
 Tropical Storm Ida and Coastal Nor'easter—Nov. 2009, p.3.
 Virginia General Assembly Water-related Legislation—Jun. 1998, p.3; Aug. 1998, p.1; Apr. 1999, p.1; Jun. 1999, p.1; Apr. 2000, p.1; Jun.-Aug. 2000, p.2; Jun. 2001, p.1; Apr.-June. 2002, p.1; Mar. 2003, p.1; Apr. 2004, p.1; Apr. 2005, p.1; Feb. 2006, p.1; May 2007, p.8; Jun. 2008, p.3; Apr. 2009, p.3; May 2010, p.3; Jul. 2011, p.3.
 Virginia State Budget Related to Water—Apr. 2001, p.1 (see also Oct. 2002, p.22; Jan. 2004, p.18).
 Walker, William R.; tribute in memory of founding director—May 2007, p.3.
 Water Facts Every Virginian Should Know (student intern article on stormwater, watersheds, groundwater, geography, and TMDLs)—Jan. 2012, p.3.
 Water Quality in Recreational Waters—Jun. 2009, p.7.
 Water Quality Overview by Virginia Secretary of Natural Resources—Nov. 2005, p.9.
 Water Quality, Impaired Waters, and TMDLs—Oct. 1998, p.1; Oct. 1999, p.1; Dec. 1999, p.1; Dec. 2001, p.1; Dec. 2002, p.1; Jun. 2008, p.6.
 Water Supply Policy and Planning—Jan. 2004, p.2; Jan. 2004, p.13; Nov. 2004, p.1; Nov. 2005, pp.1 and 4; Nov. 2009, p.7 (overview from Va. and other states).

Science Behind the News

- Algae—Jun. 1998, p.9.
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 Aquatic Plants—Nov. 2000, p.7.
 Bacteria—Aug. 1998, p.5; Oct. 1999, p.8; Aug. 2004, p.10 (at beaches).
 Beavers—Apr. 2005, p.14.

⁵ Articles on hurricane season preparedness are Jun. 2008 and May 2010.

Benthic Macroinvertebrates—Apr.-Jun. 2002, p.11
 Biosolids—Aug. 2005, p.7.
 Blue Crabs—Sep.2007, p.9.
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 Drought and Floods in Virginia—Sep.2006, p.5.
 Emerging Contaminants—Jan. 2012, p.8.
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 Safe Yield of Water Supply—Feb. 2002, p.5.
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 TMDL Development—Nov. 2004, p.9.
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 Water Sciences Overview—Feb. 1999, p.6.
 Watersheds—Feb. 2000, p.8.

Sources of Information (“For the Record”)

Aquatic Life—Nov. 2000, p.19; Nov. 2004, p.27.
 Coastal and Marine Resources—Jun. 2001, p.19; Feb. 2006, p.28.
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 Federal Legislation and Regulations—Jun. 1998, p.15; Jun.-Aug. 2000, p.19; Aug. 2004, p.27.
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 Virginia General Assembly—Feb. 2000, p.15; Dec. 2001, p.18; Jan. 2005, p.21; Dec. 2008, p.3; Nov. 2009, p.47; Jan. 2012, p.35.
 Virginia Water Regulations—Apr. 2000, p.15; Apr. 2004, p.23.
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 Water Quality—Oct. 1998, p.15; Dec. 2001, p.19; May 2007, p.34.
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 Waterways Conditions Reports—Aug. 2009, p.11.
 Weather and Climate—Apr. 1999, p.15; Aug. 2002, p.17.
 Wetlands—Oct. 1999, p.15; Jun. 2003, p.22.

Teaching Resources

Benthic Macroinvertebrates Poster Source—Dec. 1999, p.11.
 Dragonflies Poster Source—Apr. 2000, p.8.
 Federal Agency Educational Resources for Schools—Jan. 2001, p.15.
 Geology in the Southern Appalachians—Apr.-Jun. 2002, p.18.
 Internet Resources for Chesapeake Bay Education—Apr.-Jun. 2002, p.18.
 National Park Service Earth Science Explorers—Nov. 2000, p.6.
 Teach'n Fishing Workshops—Jun.-Aug. 2000, p.13
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⁶ SP indicates a Spanish translation is included.

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